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Progressive Enameling of the Plymouth Fender

By E. J. Hunt

Master Mechanic, Plymouth Motor Corporation, Division of Chrysler Motors

Fenders go through the operations of cleaning and enameling on continuous-type conveyors of unusual design

FENDERS for the Plymouth line of cars, made by the Chrysler Corporation, are finished with a baking enamel, applied in two coats. The entire process, including cleaning, is handled with continuous-type conveyor equipment. The layout comprises a "burning-off" oven, a cooling conveyor that connects with a second conveyor by passing over a bench on which wiping is done, and finally the enameling unit. The point of connection is at right angles to suit the floor space, but the passage of the work from one conveyor to the other is handled progressively so that there is no interruption to its continuous travel.

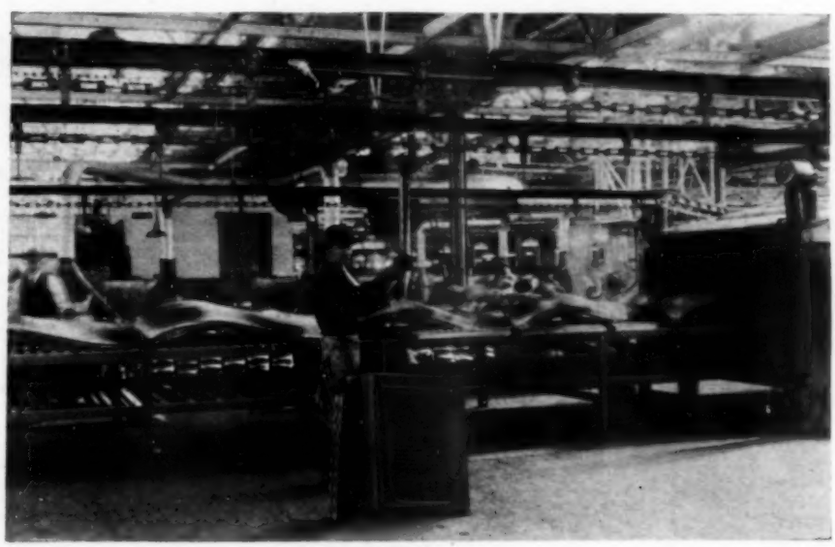

Fig. 1—The charging end of the oven for burning-off the surfaces of fenders to remove any particles of dirt or grease that may be present

A layout of the burning-off oven and cooling conveyor is illustrated in Fig. 2. This unit is made up of two separate conveyors. The work is loaded at the right directly onto the conveyor that passes through the burn-off oven. The exposed section of the conveyor is approximately 27 ft. in length, providing ample loading facilities. The length of the oven is 50 ft., and it is arranged with an incline to the center and a decline to the outlet end. The purpose of the incline is to insure that the work receives the full benefit of the heat, the temperature of which is 550 deg. F. A suitable speed reducing unit is used to move the conveyor, which is so geared that the work remains in the oven for 8 minutes.

At the outlet end of the furnace, the fenders are transferred automatically to the cooling conveyor, shown at the left, which is 54 ft. in length. Directly over the right-hand end of the conveyor is located a hood, approximately 19 ft. in length and somewhat wider than the conveyor. This hood carries off the fumes resulting from burning-off foreign matter of various kinds.

The burn-off oven is constructed with a double wall, the chamber being 3½ ft. high and 8¼ ft. wide. Suitable angle-iron tracks are built within the chamber to accommodate the forward and reverse sections of the endless conveyor. The furnace is oil fired, and the

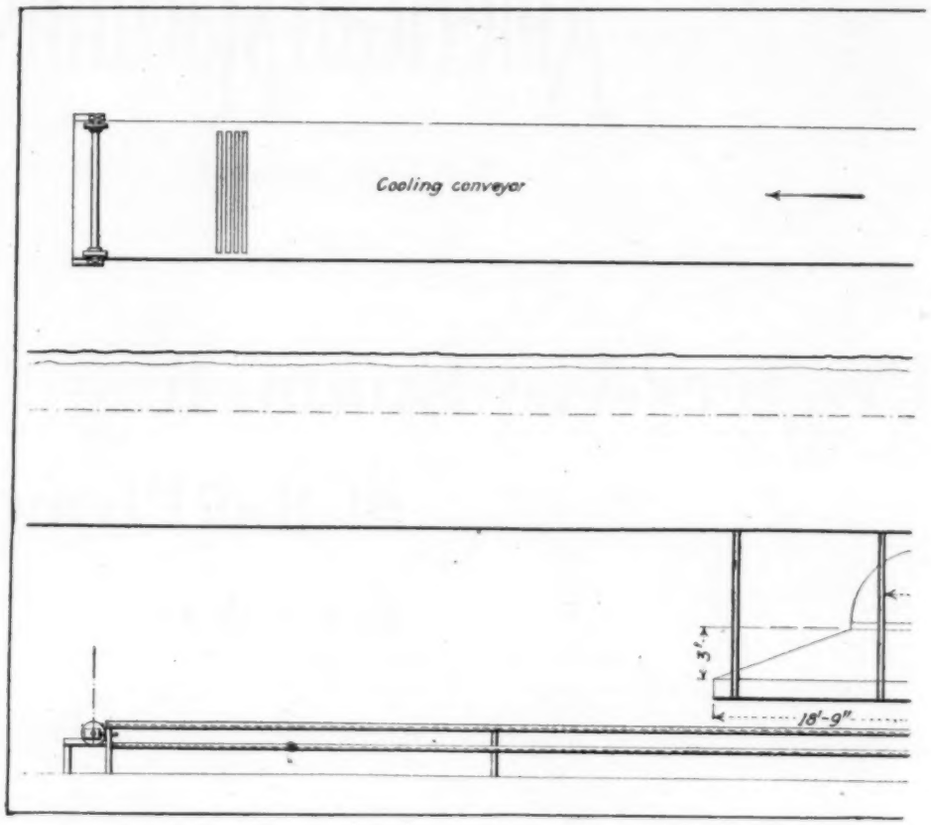

Fig. 2—The fenders enter the "burn-off" oven at the loading platform and on their passage through it, they are subjected to a temperature of 550 deg. F. for a period of 8 min. At this temperature any foreign matter that may be present is charred, and the residue is removed as it passes along the cleaning bench that connects the outlet end of the burn-off oven and the inlet end of the enamel baking oven. There is no circulation of air in the burn-off oven and the raised central portion tends to maintain an even temperature by preventing a draft through the oven

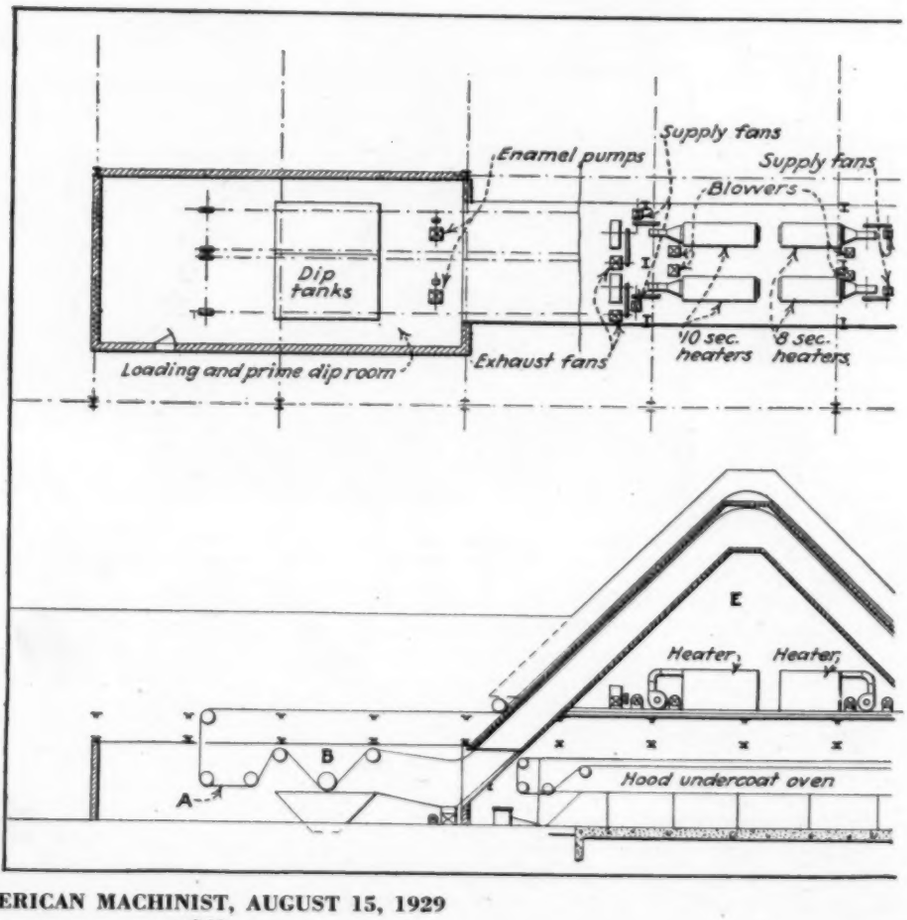

Fig. 3—The enameling installation is entirely inclosed to make it as nearly dustproof as possible. It runs parallel to, but some distance from, the burn-off oven. In this case the central portion of the conveyor is raised in order to add distance, rather than slow down the conveyor below 30 ft. per min. After passing over the cleaning bench the fenders are hung on the conveyor at *A*, and are carried, in sequence, through a priming tank of enamel, through an oven heated to 440 deg. F., partially cooled, through a finish coat tank, another oven, and finally out. The cycle of operations requires 45 minutes

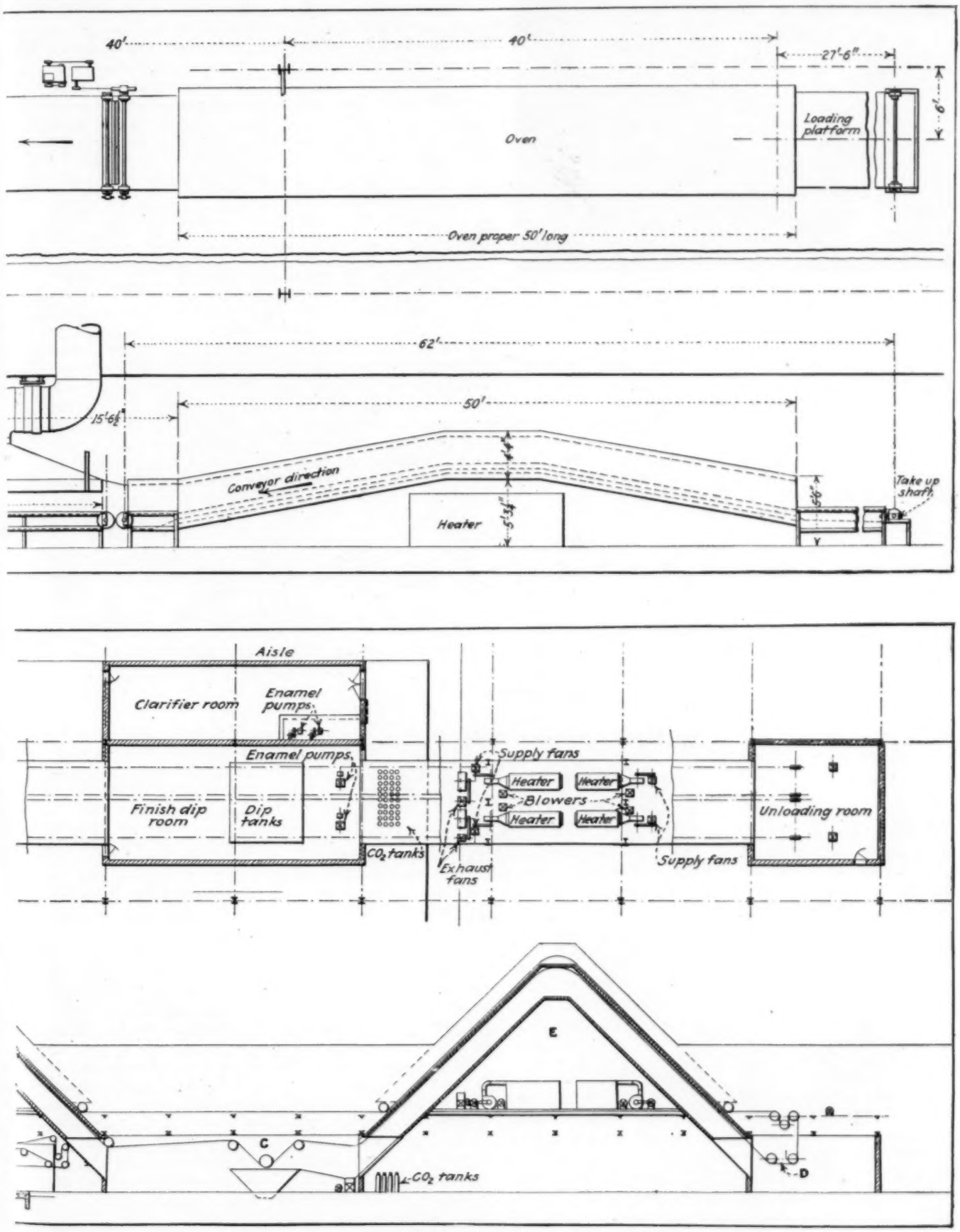
40'
40'
27'-6"
6'
Oven
Loading platform
Oven proper 50' long
62'
50'
15'-6½"
Conveyor direction
Heater
5'-3½"
6'-6"
Take up shaft
Aisle
Clarifier room
Enamel pumps
Enamel pumps
Finish dip room
Dip tanks
CO_2 tanks
Exhaust fans
Supply fans
Heater
Heater
Blowers
Heater
Heater
Supply fans
Unloading room
E
C
CO_2 tanks
D

Fig. 4—After the fenders have passed over the cooling conveyor they are transferred to a bench where the surfaces are sand wiped, cloth rubbed, and air cleaned, preparatory to entering the enameling room

heaters for its operation are located under the oven, at the center.

A view of the charging end of the oven is illustrated in Fig. 1. Overhead conveyors are used to transport the work to the loading platform. The fenders are received after buffing has been completed, but it is necessary to burn off the surfaces to insure the removal of any dirt or grease that may remain on them.

After the fenders have been removed from the cooling conveyor, they proceed to the enameling conveyor over the table shown in Fig. 4. The operations performed here include sand wiping, a cloth wipe and an air clean, the purpose of which is to remove any dirt that may have remained on the surface. When the fenders reach the end of the table they are transferred into the enameling department, which is a separate inclosure made so as to exclude shop dust which might settle on the surface of the work. A view of the finishing end of the table is illustrated in Fig. 4, showing the enameling conveyor at the rear.

The enameling conveyor consists of a series of cross bars, each of which accommodates seven fenders. From the time the work is hung on the conveyor, it is carried automatically to completion. A layout of the installation is shown in Fig. 3. The work is hung on the conveyor at *A* and receives its priming coat in the dip tank at *B*. The conveyor travel then takes the work up an incline, back again to the floor level, and through the finish dip tank at *C*. The travel then includes a second elevation and a decline to the unloading position shown at *D* in the layout.

The enameling conveyor travels at a speed of 30 in. per min., and is arranged so that the work will remain in the baking oven for 45 min. The entire enameling cycle, including the baking of both coats, takes approximately 2½ hours. Both ovens are gas fired and the heaters are located under the elevated sections as shown at *E*, Fig. 3. Reference to the plan view shown at the top of the illustration will show the respective positions of the three inclosures, namely, the loading and prime dip room at the left, the finishing dip room at the center, and the unloading room at the right. The ovens are interconnected with these rooms so that the entire processing of enameling is dustproof.

The temperature of the enameling ovens is held at 420 deg. F. The heaters are controlled automatically by thermostats so that uniform heat will be maintained.

The enameling installation was developed with the idea of preventing the deposition of dust, which past experience has shown to be a common cause of defective finishing. The results secured have been highly satisfactory. The cost of enameling too, was carefully considered, and records kept over a period of several months show that the enameling equipment has made a substantial saving over former methods.

A Wage Bonus System That Failed—*Discussion*

By Tom H. Blair

Time Study Engineer, Newport News Shipbuilding & Dry Dock Company

IN THE *American Machinist*, page 21, Vol. 71, I read an article under the heading "A Wage Bonus System That Failed," by P. H. Bryant. I do not know whether Mr. Bryant has had any further experiences with incentive systems, but I disagree with his conclusions.

He states that the plant employed only toolmakers and their assistants, and claims that these men form a class of employees doing work of a nature that does not readily lend itself to any of the existing systems of bonus payments. This is an old argument. We have often heard it said, "Yes, that plan works fine in that shop, but it will not work in ours because our work and conditions are decidedly different."

Would Mr. Bryant be surprised to know that we have a bonus system working in our storekeeping department, with 73 employees, and that we have saved about $10,000 for the first six months of this year over any six months of last year. Furthermore, both the employees and the company are very much pleased with the plan. Surely storekeeping in a large plant, not a manufacturing plant, is just as hard to handle on a bonus system as toolmaking.

I have met a lot of workmen in my time, and there are very few of them who are being paid $0.80 per hour who will not put forth a lot of extra effort if there is a chance to earn $1.10 or $1.20 per hour.

As to the old "gag" of switching time, this scheme is worked in half of the plants in the country. But if an adequate timekeeping system is in effect and proper supervision is given, very little switching can be done.

Then comes the question of rushing the work without regard to the qualtity of the workmanship or product. This problem is easily handled if the bonus earned is paid only on good work. It has been my experience that under any incentive system bad workmanship is brought to your attention that you would never hear about under the day work plan. After reading this article, it seems to me that the failure is not the fault of the plan, but rather the fault can be placed at the doors of the management.

Milling Operations on Houdaille Shock Absorbers

By Charles M. Reesey

THREE interesting operations on the Houdaille shock absorber, used on the Model A Ford, are shown in the following illustrations. The first operation is rough milling the face on the forged steel wing shaft shown at *A* in Fig. 1. A 24-in. Cincinnati duplex miller, equipped with a double pitch leadscrew is used. The work to be milled is held in a bridge-type fixture, mounted at each end of a 12-24-in. index base.

Four pieces, which are steel forgings, are located and clamped over the end by small V-blocks, the top block being clamped by a turnstile extension. The table advances rapidly to the cutting position, and is tripped automatically to a slower speed. Eight pieces are milled at one pass, upon completion of which the table is returned automatically to the starting position by the action of a dog mounted on the side. The index base is revolved and the cycle is repeated. The operator has ample time to remove the finished work and clamp other parts during the milling operation. Two 3-in. shell end mills, mounted on arbors remove $\frac{1}{16}$ in. of stock. The cutters revolve at 104 r.p.m., and the table feeds at the rate of $6\frac{1}{2}$ in. per min., giving a production of 285 pieces per hour.

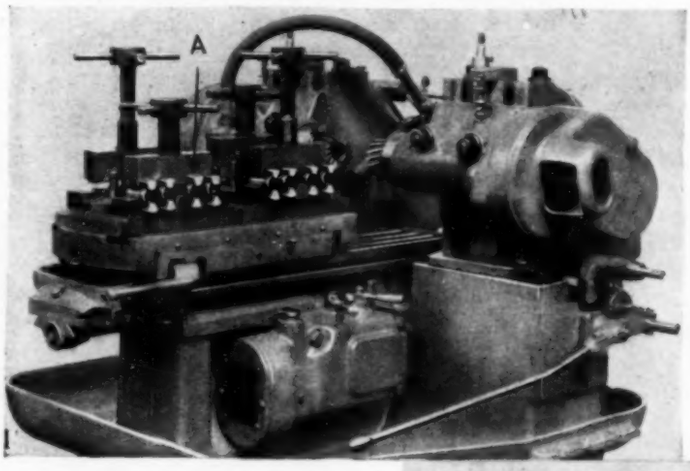

Fig. 1—Duplex miller facing sixteen parts at one pass of the table. Speeds, feeds and table reverse are automatic

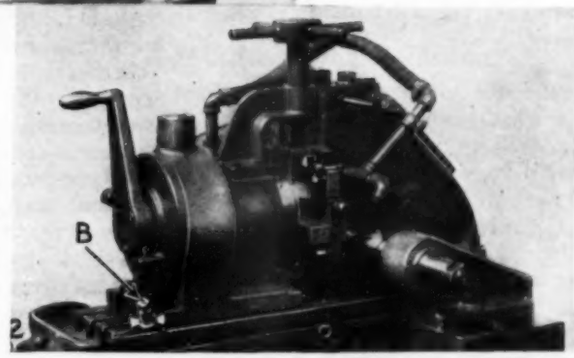

Fig. 2—Index fixture with two sets of cutters. The fixture indexes 90 deg. each time

A second operation on this same part is shown in Fig. 2. Here, the work to be milled is held in a 90-deg. hand indexing feature that is clamped to the table. Four pieces are held in V-blocks, and are prevented from turning by having the projecting part rest against a stop.

The square shown at *B*, Fig. 2, is milled complete in one pass by having two sets of cutters. The operation consists of the following elements: (1) Rapid return, (2) index 90 degrees, (3) rapid advance, (4) mill, (5) repeat same cycle. The work is loaded and unloaded in the upper part of the fixture, while the milling operation is being performed upon the work held in the lower segment of the fixture. The operation is almost continuous and keeps the operator busy.

Stock is removed by four $4\frac{1}{2}$-in. x $\frac{3}{4}$-in. side-milling cutters revolving at the rate of 66 r.p.m. The table feeds at a rate of 8.3 in. per min , giving a machine time per piece of 0.2 min., and a production of 180 pieces per hour.

Another operation on this shock absorber is that shown in Fig. 3. Here, a 48-in. Cincinnati duplex miller equipped with two spindle carriers, is used in form milling the radius of the wing. A fixture is mounted on each end of a 16x30-in. index base. The fixture holds four pieces, arranged in rows of two each. The work is clamped by means of a single lever. This machine is equipped with two spindle carriers. A setting gage is provided which enables the operator to adjust the cutters to the proper position, and indicators provide an additional means of checking them. The time consumed on this operation is very small.

Four form mills, two above and two below the work give four pieces per pass. The action of the cutters is such as to equalize the strain set up in the work. The operator loads and unloads the work at one end, while the two pieces are being milled at the other end of the base. The base can be indexed easily.

One-eighth inch stock is removed from the forging by four $5\frac{1}{32}$-in. concave cutters. The feed is 4.4-in., giving a time per piece of 0.142 min., or a production of 422 pieces per hour.

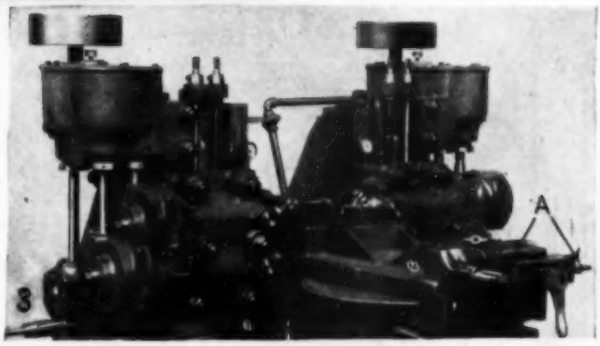

Fig. 3—Duplex miller with four convex cutters for milling radius on wing nut. At *A* the method of holding is shown

EXECUTIVE · FORUM

Neglecting Letters Loses an Order

"WHAT'S the idea of letting the Blank company's business get away from us, Jack?" It was the president of the Electric Motor Company, Sam Shelley, speaking to Jack Dunn, his sales manager. The chief engineer, Franz Zimmer, and the consultant, Bill Holland, were also in the office.

"I've been waiting for you to jump me about losing those orders, Mr. Shelley. So as soon as I knew they had placed a big order with competitors I went to see Blank to find out why. And I've been sore ever since, but I thought I'd let you start the ball rolling."

"Anything wrong with our motors or our prices, Jack?"

"Not a thing, Mr. Shelley. That's the exasperating part of it. It's just due to a lack of ordinary business decency on our part, just plain carelessness or indifference in neglecting ordinary courtesy."

"That's quite a sweeping statement, Jack. Who's the guilty party?"

"It's probably safer to call it company carelessness, but here's what happened. The Blank company's designer, Jackson, is full of ideas, and they're usually good if we can judge by the company's success. Some time ago he had an idea for public garages that involved the use of a lot of motors. Out of their line, of course, so he sent it to us to look over and perhaps utilize."

"I remember that scheme," said Zimmer. "It wasn't a bad idea at all, but I didn't see how we could go into it. Someone ought to take it up."

"Did you write him about it, Frank?"

"Don't believe I did. I hate to write letters. I had my secretary acknowledge it, but I don't believe I ever wrote him about it again. It's in my desk now."

"Well, Mr. Shelley, that's why we didn't get the order," said Jack.

"But they surely can't place orders elsewhere just because we didn't answer a letter that was entirely apart from their business," sputtered Dunn. "They can't hold that oversight against us."

"They not only can—they have, Mr. Shelley. I saw Jackson and then I saw his big boss, and he backs him up to the limit. Says there isn't enough difference in the motors or the price to cause him to worry. And then, when Jackson goes to the trouble of sending us a plan, without suggesting a cent in return, we don't even take the trouble to tell him whether or not we think it's good or bad. He's behind Jackson in specifying other motors. Says he isn't anxious to do business with a concern that doesn't appear to know politeness. He was even hotter than Jackson was over it. So I guess the loss of the business can't be charged against the sales department this time."

Things were tense for a minute or two. Then Shelley turned to Holland and said, "Can you beat that, Bill? Here we lose a nice business because we fail to write a soft, soapy letter to the designer with an idea for motors in garages."

"I'd suggest that you think it over carefully, Sam, before you try to minimize the situation. I know that in many places it's considered serious. Whether you call it psychology or just common sense, it pays just as much to deal courteously with correspondence as it does when visitors or customers come to your plant.

"Some concerns are very particular in such matters and build up a lot of good will by it. It is some secretary's job to keep track of such mail and check up on it at regular intervals. If you had such a system Zimmer couldn't have neglected the letter, and you'd probably had the Blank orders as before."

"Looks like Jackson wanted some money out of it," said Zimmer.

"It wasn't a question of money at all," broke in Jack. "Jackson knew the idea wasn't patentable, but he sure was sore to have it ignored. And from what Zimmer says it might be a winner at that."

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Idea Suggested by Robert G. Pilkington

DISCUSSION

Hiring Men from Other Industries

In the interest of fair play there should be no restrictions placed upon any responsible, capable man who wants to change jobs. Unfortunately, however, there are men who shift employment, not with the idea of becoming permanent and useful workers in their new field, but merely to seize the opportunity which some emergency has created for securing a financial advantage with no extra effort. Such men have often had trouble at the former plant and have left at a time when their services were most needed, in order to "get back" at the former boss.

While so-called gentlemen's agreements between employers regarding the hiring of each other's men are neither wholly legal, nor effective in a crisis, they indicate sources of trouble which should be corrected. Much moving around of employees can be eliminated if every employer will periodically revise his salary and wage list to see that deserving employees are rewarded with increases commensurate with their value, as workers, to competitive plants.

—D. C. WRIGHT.

Reducing the Scrap Heap

A large firm employing something like 2,000 men recently started a drive to reduce waste within its plant. Foremen and their assistants were divided into groups. There were three of these groups, each consisting of about thirty men. All of these men were asked to give their opinions as to the cause of waste, and between forty and sixty causes were listed by each group.

The men were then asked to state which one of the causes they considered responsible for the biggest waste. Gradually the various causes were eliminated until there remained but one, namely, lack of interest. Each group arrived at the same decision, although there were three separate meetings held.

The next question asked was this: "How does lack of interest cause waste in our organization?" A number of answers were received, and then the men were asked, "How can we gain the employee's interest in order to reduce waste?" Many good suggestions were received in response to this question and the management was, therefore, furnished with an abundance of valuable data.

The foremen and their assistants were then asked to go out and use the information they had gained, and were assured that the management would co-operate with them in every way possible. At the end of the month the loss through scrap and other forms of waste was again checked, and it was found that the reduction was far greater than the management had ever anticipated. —W. J. OWENS, *Foreman, Newport Rolling Mill Company.*

Cash or Royalty on Machines?

A machine tool builder can afford to sell a machine to a manufacturer for a fixed sum, plus a royalty on output, if both parties can readily ascertain the output and if the responsibilities of each side are clearly defined. Such an arrangement is justifiable with a designer, also, unless he is practically forced to accept the agreement after doing the work. If acceptance of the royalty proposition returns him a minimum of 50 per cent, and probably as much as 150 per cent, more than he would expect in cash, in twelve months' time, should he have enough to live on in the meanwhile he will regard the proposal as a good investment. In fact, it will have many of the advantages of a patent.

If such an agreement is made before the design is commenced, there may be some very difficult points to clear up. The value of a machine to the manufacturer depends not only on the factor of output, but also on first cost, reliability, cost of operation, cost of raw material, and similar factors. An increase of 1 per cent in scrap may easily offset an increase of 5 per cent in output. If output is fixed at a maximum by manufacturing conditions, the designer is tempted to concentrate on reliability, to the exclusion of all the other factors. Therefore, if the designer is paid merely to do his best for his client, he will probably come much nearer to satisfying all the demands and not just a part of them. —H. JAMES, *Birmingham, England.*

Handicapping Salesmen with Wrong Information

As a rule, details of the design or construction of equipment are lacking in the trade literature furnished to salesmen. Usually only the main points are worked out and written up as a general selling talk. A hurry call from the field for more information consequently may result in some serious mistakes.

Under present conditions, the selling of any mechanical device is the hardest part of the business. If the product can be sold, it can be made and delivered by some means. Therefore the man in the field should be supplied with all of the information it is possible to give him, and the data should be worked up in the most useful form.

It is the responsibility of the engineering department to work out the best and cheapest designs from a manufacturing standpoint and to furnish this information to the other divisions of the organization. Assembly drawings showing the main features and important data about the equipment should be available for the sales representatives. It is imperative, of course, to keep these drawings up-to-date, and all prints, except record prints of previous designs, should be immediately destroyed.

—L. O. BROWN, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

Multiplying Manpower by

WHEREVER handling is done in the metal-working plant, especially if materials, parts, or products are heavy, or are transported in large volume and over long distances, a definite opportunity is offered to save money by the substitution of mechanical equipment for hand labor. One of the most convenient and flexible installations to make is that of electric, gasoline, or hand trucks of the lift, elevating, or baggage types, or with special devices designed for the particular operations to be per-

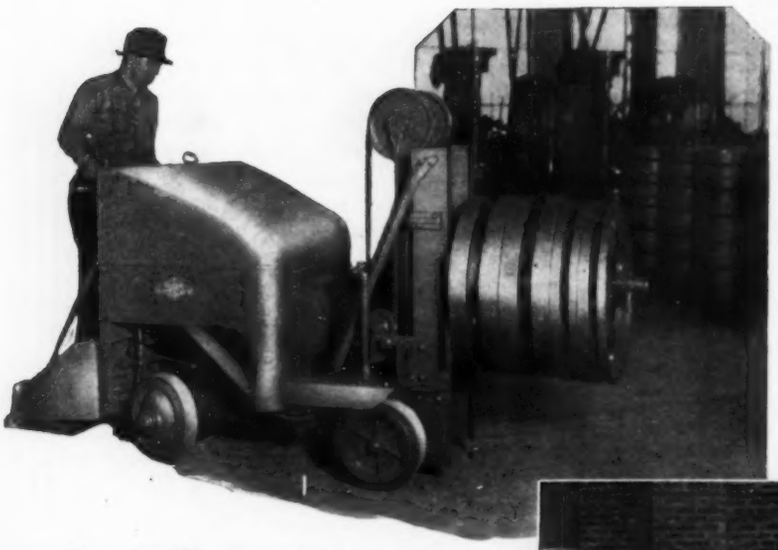

Fig. 1 — The ram-type, gasoline-engine-driven Clark "Trucktractor" handles castings, coils of wire, and similar items in 1,500-lb. loads

Fig. 2—Lakewood Engineering electric lift trucks find many uses. The truck pictured is employed for handling buckets of material in a lead plant

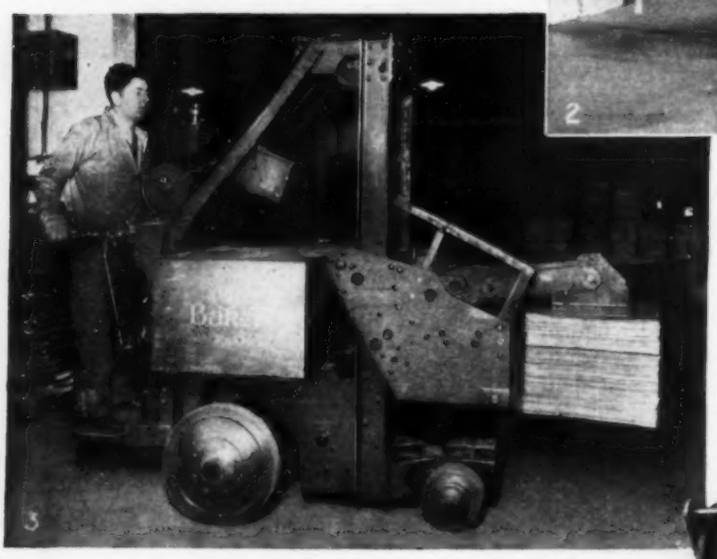

Fig. 3 — Sheet-metal plants require quick and safe methods for handling piles of steel. One type of Baker electric lift truck is provided with a convenient pick-up arm for this purpose

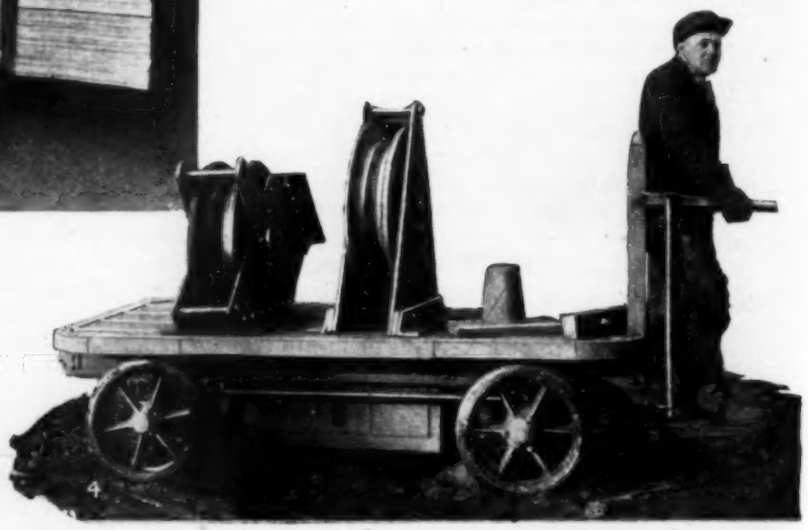

Fig. 4 — In some cases it is more convenient to carry loads by the baggage type of electric truck such as this one of Crescent design. When light loads are transported the trucks can be loaded by hand. If crane service is available at loading and unloading points, weights up to the capacity of the truck can be handled readily

formed. Trucks are unlimited in their scope, have independent power units, carry heavy loads with speed and safety, and require only one operator.

A truck will usually repay its investment cost within a year, sometimes within three months. Every truck does the work of at least one extra man. Many do five, ten, or twenty times this amount. Such units should be looked upon as multiplying manpower within the plant.

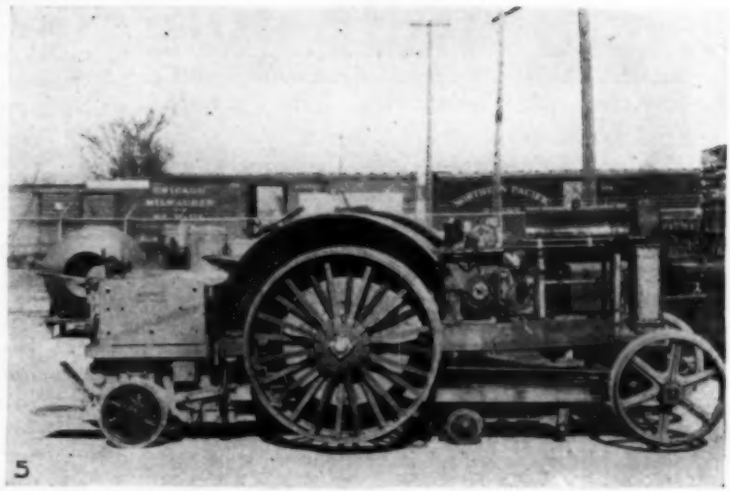

Fig. 5 — A long platform on this Automatic Transportation electric lift truck enables it to handle assembled tractors

Fig. 6—Mercury electric tractors with "Lif-Trans" trailers handle large reels of wire rope

Fig. 7—Electric elevating trucks, such as this Wright-Hibbard machine, lift heavy loads to heights convenient for stacking, or unloading on shelves. The upright channels may be constructed to lower when passing through doorways.

Fig. 8—Hand lift trucks of the Stuebing - Cowan type have found wide employment for transporting heavy loads in metal-working plants to relieve the drudgery and reduce the cost of handling

· BOOK · REVIEWS ·

A HISTORY OF MECHANICAL INVENTION. *By Abbott Payson Usher. Four hundred pages, 6x9 in. Cloth boards. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, N. Y. Price $5.*

THIS book defines invention as the "urge to gratify an obstructed desire" and traces its influence upon the settling of pioneers in far places and upon the progress of a people as a nation. One part of it deals with prehistoric invention, another with the principles laid down by Aristotle and Archimedes, still another with more modern developments, but the discussion is not technical in the usual acceptance of the word.

This book should be of interest to the mechanical executive, the engineer, draftsman, and student. In fact, the student who desires to acquire a background of mechanical history will find it brought together in this book in such a way as to save him much time and research.

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MAKE EVERYBODY RICH—INDUSTRY'S NEW GOAL. *By B. A. Javits, in collaboration with C. W. Wood. Three hundred pages, 5½x8¼ in. Board covers, imitation leather back. Published by the B. C. Forbes Publishing Company, 120 Fifth Ave., New York, N. Y. Price $3.50.*

AMONG the flood of economic and business books now appearing there seems to be one class that thrives on overweened enthusiasm. This book, while it contains much that is good, is decidedly not up to the standard of most Forbes books. The author has attempted to run rapidly over the whole economic background of industrial life, and as occurs in so many hasty summaries, he ignores causes and mitigating influences so that even he himself is lead into misconceptions.

Because of this, and the laudatory nature of the work, page after page often reads like a high-school essay. He has much to say about the antitrust law that is good, and at the end he offers certain amendments to the trust laws to promote industrial co-operation, but it would seem to a careful reader that inadvertently he has built up a strong case for industrial government by contract, which apparently was not the intention. If the material in the final conclusion chapter had been more definitely co-ordinated with other matter in the book and the light-weight matter dropped, it might have served better to get the points across.

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INDUSTRIAL STANDARDIZATION. *A study by the National Industrial Conference Board, Incorporated. Three hundred six pages, 6x9 in. Cloth board covers. Published by the National Industrial Conference Board, Incorporated, New York. Price $3.50.*

IT IS the purpose of this book, states Magnus W. Alexander, president of the board, "to present a simple and clear statement of the nature and meaning of standarization, to describe the structure of the industrial standardization work of individual concerns and various organizations, to examine the economic advantages claimed for standardization, and to discuss some of the problems involved." In carrying out this plan the organization of the standards departments of several well-known firms have been described and the standardization activities of engineering societies and trade associations throughout the world have been summarized. Such a comprehensive study apparently required an immense amount of work and reference to many sources of information. It supplies a need for a comprehensive non-technical description of standardization as a whole.

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HEAT-TREATMENT, USES, AND PROPERTIES OF STEEL. *By H. B. Knowlton, metallurgist, Fort Wayne Works of the International Harvester Co. Four hundred thirty-seven pages, 6x9 in. Cloth board covers. Indexed. Published by the American Society for Steel Treating, 7016 Euclid Ave., Cleveland, Ohio. Price $4.50.*

THIS is an easy-reading book, considering the nature of the material. It is quite comprehensive and makes a good reference treatise on the whole subject of the physical properties and heat-treatment of all usual classes of steels. There is, however, little new in the way of original investigation in the book, and much of it seems to be taken from papers and other publications of the Society. But the convenient and easy-reading form in which the author has gathered so much of the material on the subject makes the book a welcome addition to any metallurgist's or heat-treater's library.

The first chapter takes up the general properties and describes methods of making tests. The subjects of hardening, tempering, annealing, casehardening, and carburizing are treated in separate chapters. Other sections are devoted to the properties and treatments of various alloy steels, furnaces, quenching, and cleaning. Some charts and tables are given.

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FOREIGN TRADE IN 1929. *Official proceedings of the Sixteenth National Foreign Trade Convention. Two hundred ninety-five pages. 6x9 in. Cloth board covers. Indexed. Published by the National Foreign Trade Council, India House, Hanover Square, New York, N. Y. Price $2.50.*

RECORD of the progress in foreign relations during the year, notably in the other Americas, is contained in this book. The complete addresses on various aspects of foreign trade as delivered at the convention, and the discussion on these subjects, are included in the volume. Presumably, it is up-to-the-minute information by experts engaged in foreign trade work. The subjects include: Prospects of United States Foreign Trade; Political, Economic, and Cultural Pan-Americanism; Economic Developments in Algeria, Northern Africa, and the Colonies of France; Canada—Our Best Customer; The Railroads and Foreign Trade; and a number of related topics. A list of the delegates to the convention, with their company associations, is printed in the back of the book. It should be interesting to manufacturers engaged in foreign trade.

Spacing Lights for Shop Illumination

By Louis J. Cahill
Westinghouse Electric & Manufacturing Company

Illuminating units should be of sufficient intensity and be spaced so as to illuminate both the horizontal and vertical surfaces

THE many processes and various methods of production in the factory make the task of proper lighting a difficult one. The trend in new factories or where new lighting is to be installed is to provide general illumination with reflectors symmetrically arranged. This method of lighting gives a uniform illumination over the whole room, provided the spacing and mounting height are correct and the reflector is properly lamped. Correctly installed general lighting is ideal for the factory and requires the fewest outlets. It is flexible in that it provides good lighting for most any location of machines so that a rearrangement can be made without a change in wiring outlets.

The reflectors being arranged symmetrically with the spacing distance between them approximately one and one-half times the distance from the working plane to the bottom of the units, will give an illumination on a vertical surface, of about two-thirds the horizontal illumination. The lighting of any working area should be arranged so that a uniform intensity of illumination will be obtained, as spotty illumination causes eye fatigue due to the necessity of its continually accommodating itself to differences in illumination values.

The general lighting arrangement of a large machine shop is shown in Fig. 1, where 300-watt bowl enameled lamps with reflectors produce an intensity of 18 foot-candles. The units are mounted higher than the spacing distance, and give a uniform illumination on the horizontal plane as well as a high intensity on the vertical plane. This illustration shows clearly that a rearrangement of machines could be made without a relocation of the lighting units and still have just as effective lighting for the new arrangement.

In foundries or assembly areas where large parts are handled by cranes, the ceiling is usually 30 to 50 ft. in height. These areas are best lighted by reflectors designed for high mounting, and unless there are valid objections these should be placed high enough to clear

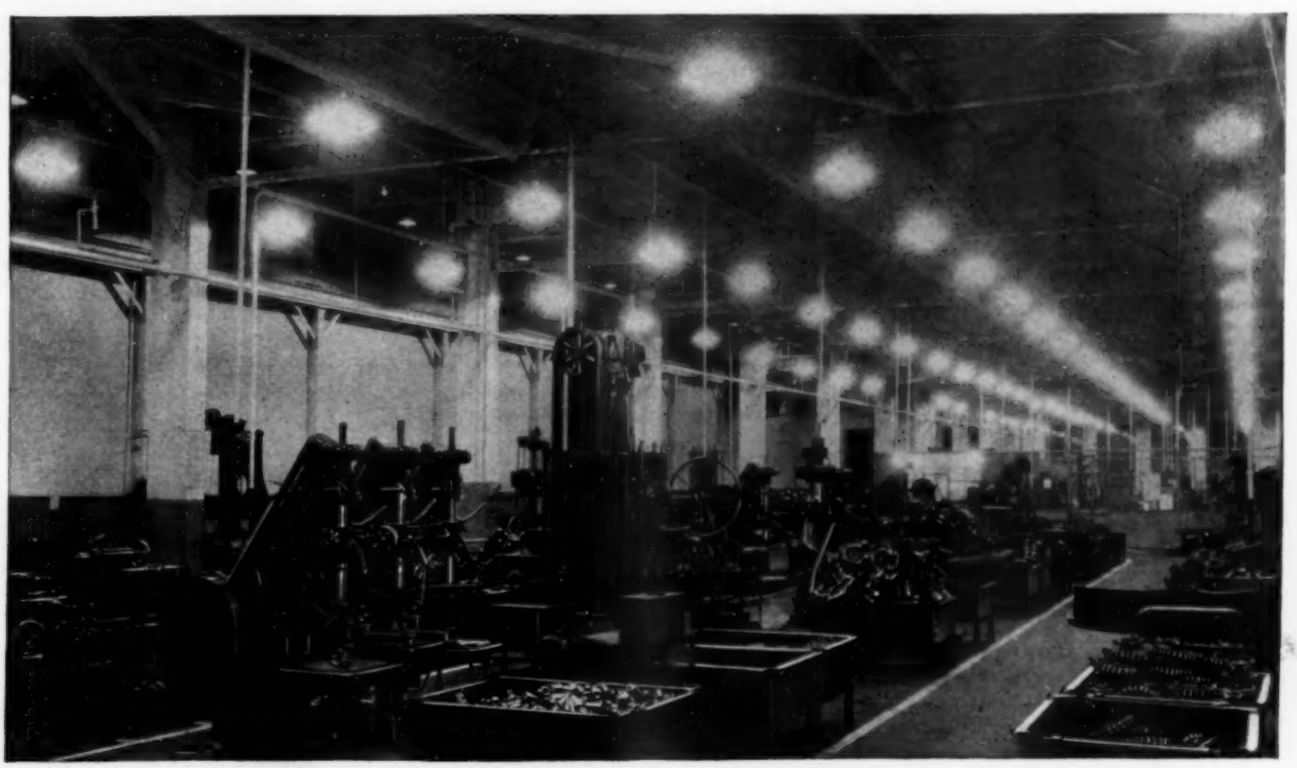


Fig. 1—General illumination produced by 300 watt lamps. This arrangement gives good light on the vertical as well as the horizontal areas, and does not cast deep shadows

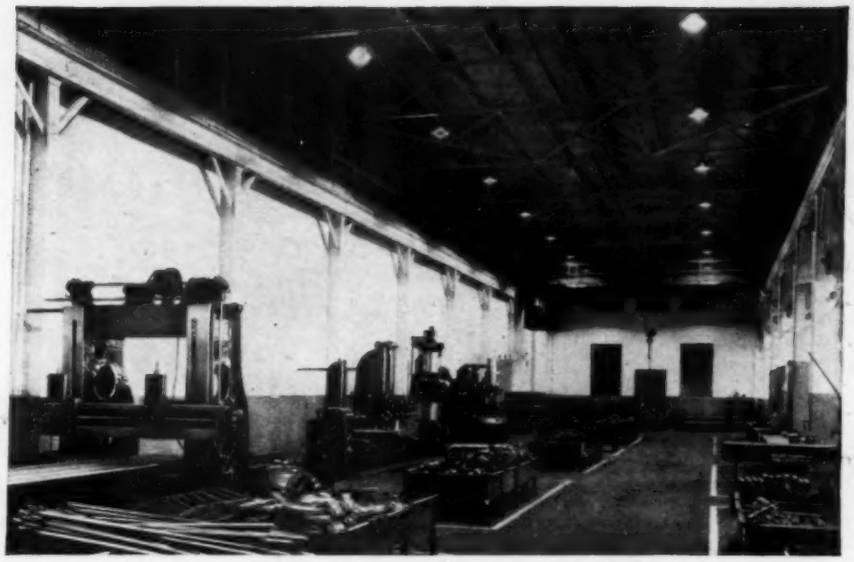
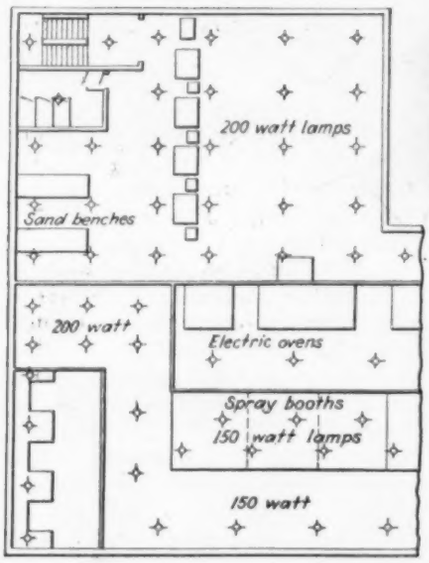


Fig. 2—Method of hanging units over a crane-way. Clean, light-colored walls and ceiling are a decided help in an installation of this general character



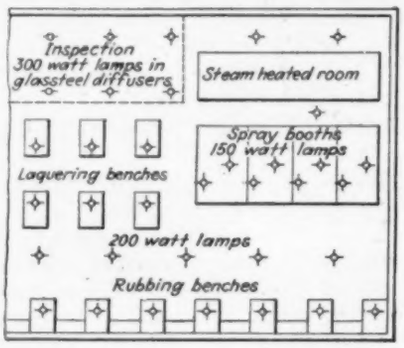


Fig. 3—At times the machine layout or the type of work does not allow general illumination to be used. In such cases a specific layout for each section is necessary

the crane. The ceiling of such a building usually consists of structural cross beams supporting the roof. High mounting reflectors should be symmetrically arranged in one or more rows. They may be mounted on every beam, or on the first beam and between the second and third. This arrangement of units depends upon the width and height of the room and upon the number of trusses, as well as upon the amount of light needed for the particular operation.

Where walls are dark, or where high vertical illumination is desired, elliptical or symmetrical angle reflectors may be mounted on the side walls under the crane rails about 20 to 25 ft. above the floor, and equipped with the proper size of bowl enameled units. This mounting height is necessary in order to keep the light source above the line of vision of the workmen. Care should always be exercised to see that reflectors are fitted with the proper lamps, since an underlamped reflector results in too sharp a cut-off, causing spotty illumination. Overlamping on the other hand, allows the filament of the lamp to come below the proper position in the reflector, causing glare, which is always detrimental.

The illumination obtained in a craneway of the same plant by using two rows of high mounting units consisting essentially of narrow beam chromium-plated metal reflectors is shown in Fig. 2. Here the reflectors are mounted two on each cross beam high enough to clear the crane carriage and hand rail. The men obtain full benefit of the light produced due to the white walls and light colored ceiling. No angle reflectors are necessary in this room, because an effective vertical illumination is obtained by the high-reflecting qualities of the walls.

Another method of lighting factories where much machine work is done should not be overlooked. This method, called modified general lighting, consists essentially in locating the lighting units with respect to the machines, the position of the operator, and the procedure of his operation. With this method of lighting, the units are not arranged symmetrically unless it happens that similar machines are arranged in long rows.

Modified general lighting should be used only when it is certain that the arrangement of machines is permanent, because a change in location of a machine necessitates a change in location of an outlet. The modified general method of lighting is made with a view to economy in lighting equipment, although in some industries it is almost a necessity due to the various types of operations carried on in one room. It seldom results in more than 15 per cent reduction in the number of outlets, and sometimes takes more than would be needed with a symmetrically arranged general lighting system. Its principal disadvantage is its inflexibility. Usually, two or more lamp sizes are used, necessitating a larger stock of lamps for replacement, high maintenance, and the danger of overlamping or underlamping a reflector after cleaning. In making a layout for modified general lighting, care should be taken to see that the distance between units does not cause spotty illumination or too much change in intensity between adjacent units.

An arrangement of machinery and benches in which general lighting would be neither desirable nor economical is shown in Fig. 3. The reflectors are arranged

to provide sufficient light from the proper direction on machines and benches so that operations can be performed rapidly. With this arrangement adequate light is provided on the work and sufficient light from the same units illuminates the aisles. Reflectors equipped with an enameled bowl, or inside frosted lamps should be used throughout except in the inspection department where, due to the color and finish of the product, in this case, dental equipment Glassteel diffusers equipped with daylight blue globes provide the desired color quality in the light. Vapor-proof units fitted with reflectors to protect the operator from direct light are used in the spray booths and over the lacquering benches.

In some industries where close attention must be given to some particular operation, it is necessary to use local lighting along with the general lighting system. This lighting should not be done with a bare lamp hung haphazardly as this blinds the operator and slows up production.

Local lighting should only be supplementary to general lighting. The unit should have a reflector that confines the light upon the spot where the closest attention is needed and in such a direction as to prevent specular reflection from striking the eye of the workman. It should be supported rigidly but arranged for easy adjustment. In rooms where local lighting is necessary, a moderately high intensity of general lighting should also be used so when the operator glances away and back to his work, the change in intensity will not cause squinting or loss of time for the eye to become accustomed to the change.

Where considerable vibration is caused by punch presses or other machinery, the lighting units should be suspended from shock-absorbing hangers. These hangers consist essentially of a spring arrangement which absorbs the shock of the vibration and minimizes lamp failures.

To facilitate maintenance where units are mounted high, the installation of an automatic cut-out hanger similar to that shown in Fig. 4, is good economy. With this hanger, the reflector and lamp can be disconnected from the line and lowered to the maintenance man standing on the floor. This method of servicing units speeds up maintenance and at the same time eliminates the danger of shock or falling. After cleaning the reflector, it is only necessary to pull it up in place where it is again automatically connected into the lighting circuit and the hand line used in the lowering operation is detached. Maintenance of the lighting equipment should be placed on a periodic schedule. One person should be made responsible for the maintenance of the reflectors and lamps. Cleanliness in lighting fixtures is conducive to neatness and order in the plant and carefulness in care of machines; it encourages good workmanship as well as producing maximum illumination with minimum power.

It isn't always the fault of the grinder when a hardened piece cracks during or after the grinding operation. The crack may be due to hardening, but not show up until the grinding operation. Here is where close cooperation between hardening and grinding pays.

Don't confuse grain and grade in grinding wheels. Grain refers to the size of the abrasive grain used, while grade means the hardness of the wheel due to the bond used and the process used in making the wheel.

SEEN · AND · HEARD

By JOHN R. GODFREY

Temperature and Inspection Modern Heat Treatments

INSPECTORS frequently need a goodly supply of the uncommon commodity known as common-sense. Unfortunately, a lot of them are sadly lacking in that respect. The idea of rejection seems to be so strong in many cases that they jump at the conclusion that the manufacturers are trying to put something over on them, and they do not stop to look at all sides of the question. The inevitable result is misunderstanding and disagreement between production supervisors and inspectors, for no shop man likes to be the "goat" in order to increase the prestige of an inspector.

A case of this kind occurred a few winters ago in a plant building airplane engines. The inspectors reported that several hundred pistons were too small and engines were waiting for them. The general foreman was a careful observer, and he ordered all of the pistons and gages taken to his office until he got time to come there. Then he stayed away for two hours, asking the inspectors to meet him there at the end of that time. When they were all there he picked up a piston at random, put the gages on it and it was O.K. He passed it to the inspector, who was puzzled and reached for another piston. Then the G. F. spoke his little piece, about as follows:

"You birds are so anxious to reject work that you seem to forget one of the first principles of gaging, and that is temperature. You sent the pistons up to the inspection room last night and let them stand all night in the cold. This morning you take the gages out of a warm toolroom and start to inspect the cold pistons. Of course they're small! Instead of remembering that we generally make things right, and looking for the reason, you grab the chance to reject a bunch of pistons so as to have something to write home about.

"So I had the pistons and gages both brought down here and left them long enough to even up the temperature. Now, as you see, they are all right. I'm going to suggest that you look for reasons before you reject parts. And remember that temperature plays a great part in determining sizes of metal parts."

* * * *

APPEARANCES are frequently deceptive—in steel as in less material things. The case in point refers to the wonderful structure that we now produce in low-carbon, alloy steels. Some of these are so fine that they are actually better than the old, high-carbon steels for some purposes.

The maker of a very fine tool steel was visiting the plant of a large consumer that had, "unbeknown" to him, begun to use low-carbon, alloy steel in place of his. In going through the plant he found some parts broken to show the grain, and studied them intently. "It took us many years to learn to make steel like that," he said with pride. And the shop manager didn't have the heart to disillusion him by telling him that the piece was of low-carbon steel, carburized and heat-treated.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been arranged

A Bonus for the Ambitious

"GOT something on your mind, Ed?" asked Al. "You look as though your lunch wasn't resting easy."

"Never mind my lunch. And that isn't where I keep my mind, either."

"Now I know something's bothering you. What is it?"

Ed knocked out his pipe. "Well, it's like this. You know that young White who's been in my department about a year now?"

Al nodded. "Likely kid," he observed.

"Sure," agreed Ed. "But he's got the bug he wants some education. Thinks he can't learn fast enough in the shop. He asked me should he try some of these correspondence school courses, and which ones."

"Which ones did you recommend?"

"Well—um—the fact is I didn't recommend any. Told him he was learning fast enough here, and that I never saw anybody get much money just because he took a correspondence course. But the more I think about it, the more I believe I gave him a bum steer. I did have two pieces of pie for lunch, and it is hot this afternoon."

"No wonder your conscience, or the pie, troubles you, Ed. I think you ought to have another talk with White and change your tune a bit. Why, you know, over at the shop where my cousin Jim works they have a notice on the shop bulletin board that says the company will pay any employee who completes a course in a recognized correspondence school or extension university, while he is on their pay roll, an extra week's pay. That shows how they feel about ambitious youngsters."

"Maybe that's all right, Al, but don't you think that might get big ideas in some fellows' heads? They might get to thinking they were better than their foreman."

"Not if the foreman was as much interested in getting himself ready for a better job, Ed, but, while you are changing your tune, don't go too far the other way and sing a siren song that will make him spend good money for nothing."

"How do you mean, Al? Are you backing down now?"

"No, indeed, but I have in mind that only a small percentage of people who start a correspondence course ever finish it. When a man does finish his course, the school sends a notice to his employer, and one paragraph reads something like this: 'The fact that Tom Brown has finished his course, is in itself a recommendation,' and I think they are right."

"I'll say they are, Al. I was ambitious myself once. I'll see the kid again."

"Make up your mind whether he's a sticker —or not, before you commit yourself."

Should employees be encouraged to take correspondence courses? Or is there a danger that good craftsmen will be spoiled by yearnings for executive jobs?

All foremen are urged to discuss these questions vital to their work; of course the

DISCUSSION OF EARLIER TOPICS

Belts, Foremen and Paper Work

WILLIAMS realizes that only the experience and observation of a man who is in close contact with the matter can give him the exact information he requires in order to make a decision. On the other hand, the foreman who is forced to study and analyze conditions in his department cannot help but be a better one, and the time will come when the information he has acquired in this way, will be of benefit to him. Modern technique has no limit. New and unexpected combinations are frequently encountered, and we shop executives have considerable influence in directing the course of these combinations. Williams wants reasons, not figures, and so he looks to his foreman for them.

FRANZ BERMANN, *Supt., Locomotive Factory, Austrian-Hungarian State Railway, Vienna.*

*

Should We Buy Tools by the Pound?

IF A TOOL can be put to a use in production that no other tool will do as well, then the question of price does not enter. As a rule, steel that is expensive is used in the form of tips welded on to larger sections of cheaper grade steel and may only weigh a few ounces; and as long as it will produce work economically and accurately the price will not matter. I have had small pieces of tool steel, held in holders, that would remove the same amount of material in a given time as other solid forged tools weighing from 10 to 15 lb. and costing the same price per pound. Such tools are kept hidden by the workman who discovers them and are only used on special hard castings or forgings. Such a tool cannot be valued too highly. So, it is what a tool will accomplish before being worn out that sets the value.

—H. MAPLETHORPE, *West Bromwich, England.*

NOW that new alloy cutting tools are being brought out, we are entering an era in the "tool game" similar to the one caused by the introduction of high-speed steels. Usually, in those days, it took a resolution by the board of directors and a lot of explaining by the superintendent to induce the purchasing agent to buy a trial order of the high-priced material, but as greater production was the result of the trial, the high price was soon forgotten.

As to the results we will get from the use of the new alloys, the answer is now in the hands of the machine-tool builders. They are facing the same problem in the re-designing of their machines that they were when high-speed steels were introduced. But when they have finished the job of redesigning their machines to withstand heavier feeds and greater speeds, we will be able to determine the value of the new alloys.

—S. E. HAMILTON, *Machine Shop Supt., Gates Rubber Company.*

THE cutting material in question is new, and the price appears not to be competitive, and therefore seems high relative to existing prices for material to do similar work. Before we can criticize the first cost, however, we shall have to consider other factors which may make it cheap under certain conditions. Williams should not turn the new material down, but should do a lot of thinking before coming to a final decision.

Some of the considerations he might reasonably study are: For what particular purpose are the new materials required, and on what particular jobs can they be used? Could they be kept in use without undue idle periods if they are bought? Are the machines on which the material will be used of sufficient strength to stand up under the conditions to which they may be subjected? These are some of the questions which have to be answered before the question of first cost can be answered and should the answer be favorable, the relative costs would also have to be carefully studied.

—ARTHUR BRAMWELL.

*

Keeping Posted on New Tools

AL HAS the right idea when he tries to keep posted on new tools or machines that are being placed on the market, for even though the tools or machines may never be used in his department he will have added just so much more to his store of knowledge. A foreman never knows when he may need to use the information gained through reading the descriptive matter which is constantly being printed concerning new tools and equipment. A thorough understanding of the work at hand is necessary, and the man who is always prepared is the one who is advanced most rapidly, but we do not need to slight the job at hand in order to be prepared for the job which may be coming our way in the future.

—FRANK A. HYDE, *Time Clerk, Walworth Company, Kewanee Plant.*

*

Ed and Al Agree on Obsolescence

THE method of fixing obsolescence, used by the firm by which I am employed, although somewhat simple, has proved to be successful. First of all we employ a large force of engineers who are kept busy following the progress of the machine production in our shop. If a machine falls down for any reason whatsoever, the cause must be determined and submitted in writing to the machine development chief whose duty is to make all decisions on the course to pursue. We carry in special files a card for each machine in the plant, with details of its performance.

If a manufacturer approaches us and claims that he has a machine which has double the capacity in productive

discussion is not limited to foremen. Letters accepted and published will be paid for

value of one now installed on the floor, the first thing we do is to have him submit all data pertaining to the machine, this matter being turned over to one of the engineers. The engineer works up a standard cost reduction sheet, using our standard machine replacement formula to show how long it will take for the machine to pay for itself, and the amount of net profit over that period of time. All of this information is recorded in detail, together with comparative figures showing the advantages of the new machine over the old.

At this point the matter is threshed out in detail between the engineer, shop foreman, and chief development engineer, so that any little flaws in the copy can be remedied. The latter then approves it, and sends it to the higher executives for their approval. After the cost reduction sheet is completely approved, a requisition is placed with the purchasing agent requesting him to purchase the equipment. When the machine arrives, it is installed and is put through a two-month test to ascertain its efficiency. If it comes up to expectations it is turned over to the shop, and is recorded. If it does not, a very good reason must be given, and the manufacturer is called to account.

It is not always an easy matter to determine whether a machine is obsolete or not, just because a new machine appears on the market which seems far superior. We have had cases where by changing over a machine at a cost of a few hundred dollars it has proved superior to those advertised as the best. But when it comes down to "brass tacks" of meeting competition obsolete machinery must be discarded, and the best obtainable installed. —FRED AUG. SCHMIDT, *Industrial Engineer, Western Electric Company, Kearny Works.*

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Picking Men in Cheerful Surroundings

IT IS good policy to attract the best men to a plant. One way of doing this is to impress them favorably, and to do so at the very outset. Where a man is received for an interview, how he is received, and especially the manner and bearing of the one who does the hiring, have much to do with whether he accepts a position, if it is offered to him.

First impressions, important as they may be, are far from being the whole story. Not only is it good business to attract the right type of workman, but it is even more important, once they are hired, to keep them. This cannot be done unless conditions generally are in keeping with what a man has been led to expect from the impressions formed at the engagement interview. Where the desire to attract and keep good men is maintained throughout the entire range of working conditions, nothing but good can come from what is a sound means to an important end.

—W. ROLAND NEEDHAM, *Stafford, England.*

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Reporting Minor Injuries

ED, WHAT is wrong with your department that your men are afraid to report minor injuries? We have a safety board that shows our daily and monthly accident records here at the Boston and Albany Railroad Shops, in Worcester, and it has proved an advantage, instead of a detriment, in uncovering minor injuries. Every man in the shop takes an active interest in keeping the "no accident" line straight, and instead of hiding minor injuries, their fellow workmen insist that small injuries shall have attention so that they will not develop into lost-time accidents through infection.

Is it possible, Ed, that your attitude toward ideas from "bright young scouts in the office," is reflected in the lack of safety co-operation among your men? Safety in operation is an advertising proposition. Keep it eternally before your men. Use safety boards, comparative tables, and bulletins to put it over. We are getting results, not because we are safe-guarding and removing unsafe conditions, but because we are instilling safety-mindedness through pure propaganda. Take your men into your confidence, Ed, make them a part of your campaign. Never mind where the ideas come from, get a little enthusiastic yourself, and you will find the board a help and not a hindrance. —TOM CONROY, *Safety Committee, Boston & Albany Shops, Worcester.*

* * * *

THE · NEXT · TOPIC

"Games at the Noon Hour"

Belts, Foremen and Paper Work

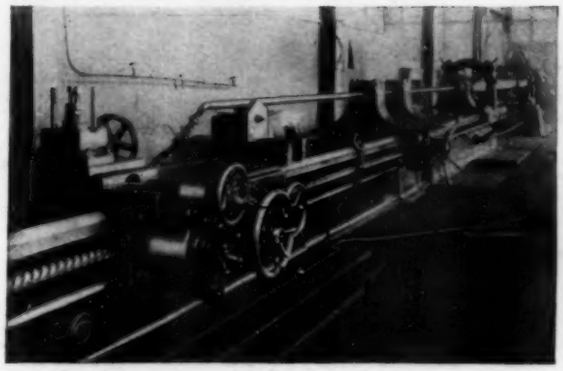
SUMMARY OF THE DISCUSSION

Ed objected to keeping records on belt costs, he said that Williams could secure them from the cost department, or that the stock clerk and belt repair man could furnish the information just as well as he could. Al replied that actual facts regarding maintenance costs could be secured only from the foreman responsible for them. He suggested that the gathering of such information might be helpful to the foreman.

IT WAS generally agreed that the less paper work a foreman had to do the better, but all of the contributors to the discussion upheld Al's views upon the subject in this particular case.

One writer described a parallel case in his own experience. His first reaction to the request was similar to that of Ed but eventually he came to look upon it as a compliment paid to his ability in that direction, and his interest in the subject led to promotion.

Another contributor stated that while compiled and summarized costs have their uses, detailed interpretations of shop costs must come from the foreman, and that although the accountant allots costs he does not always know the reason for them. Another said that inasmuch as the foreman is responsible for costs in his department, it is to his advantage to know the facts concerning them. Several systems were described whereby the work attendant upon compiling the information was minimized, but in every case the gathering of such data by the foreman was held to be justifiable.



A Deep-Hole Drilling Job

By Hubert E. Redden
General Superintendent, American Well & Prospecting Company

Two lathes are inter-connected and a special tool is used for the drilling of a large-diameter hole in very long bars

PRIOR to adopting the deep-hole drilling equipment described here, the American Well & Prospecting Company, Corsicana, Texas, found that drilling "kelly" sections was not simply an average machine job. The difficulty lay in drilling a 2½-in. hole through the entire length without having it "run out." Kellys are S.A.E. 1,040 steel bars in lengths of 28, 30, and 35 ft., as illustrated in Fig. 1, and are used in connection with the rotary drilling tools for oil wells.

In use, the sections are connected to the drill stem by a joint resembling a sleeve with an internal thread at each end. A rotary drilling tool is attached at the lower end of an assembly, so that it acts as a connection between the source of power and the cutting tool. A square section is used because it presents a more convenient form of drive. It is more positive in action, and can be easily applied. The hole through the center is for conveying a lubricant to the bit head and to flush out the cuttings. The bit is usually a forged body coated with a hard facing or with tungsten-carbide inserts at the cutting edges.

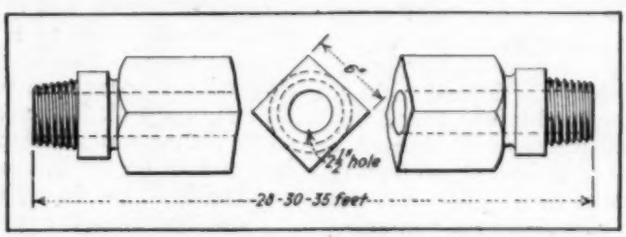


Fig. 1—Details of a "kelly", made of S.A.E. 1,040 steel, 6 in. square, and varying in lengths of 28, 30, and 35 feet

For drilling the hole, two machines are used, interconnected to accommodate the unusual length. One is a 36x42-ft. gun-boring lathe, and the other is a 28-in. engine lathe. These machines are shown in Figs. 3 and 4 with a section in place. The end to be drilled is fitted with a threaded sleeve and is supported by a steadyrest, as illustrated in Fig. 5, which is attached to the ways of the gun-boring lathe. The opposite end is held in the 28-in. lathe by a four-jaw chuck, while the end thrust is taken by a cup-shaped ball-bearing center located in the tailstock. An intermediate support is furnished by an auxiliary steadyrest mounted on a concrete foundation. Since the "kelly" is square in cross-section, a bushing is used as a bearing for the steadyrest support. The bushing is held by

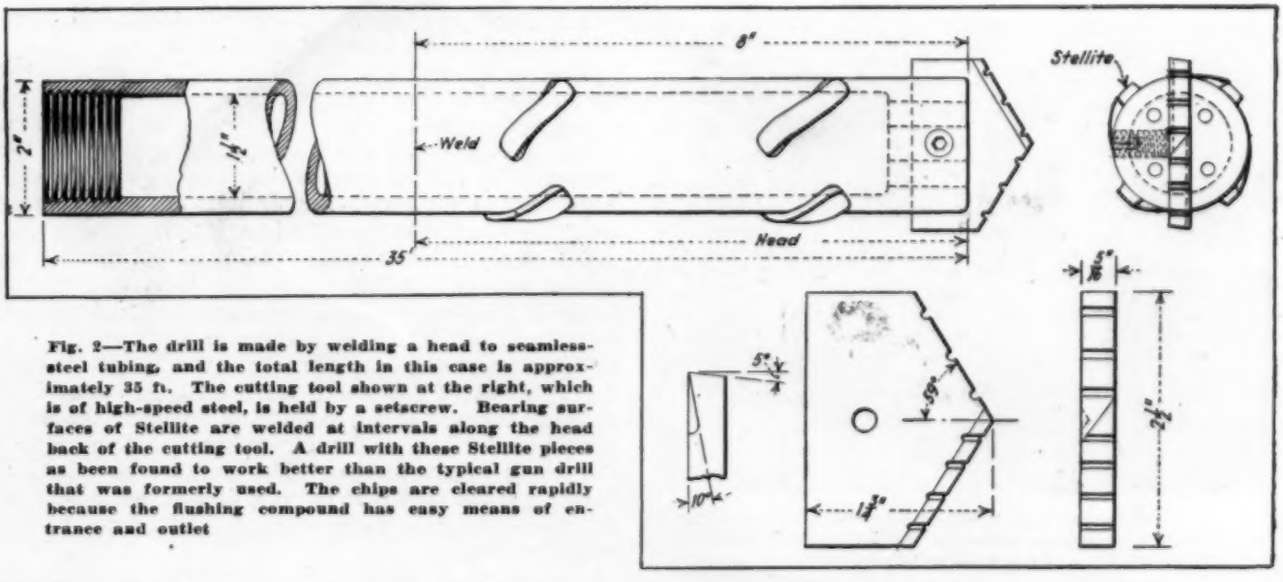
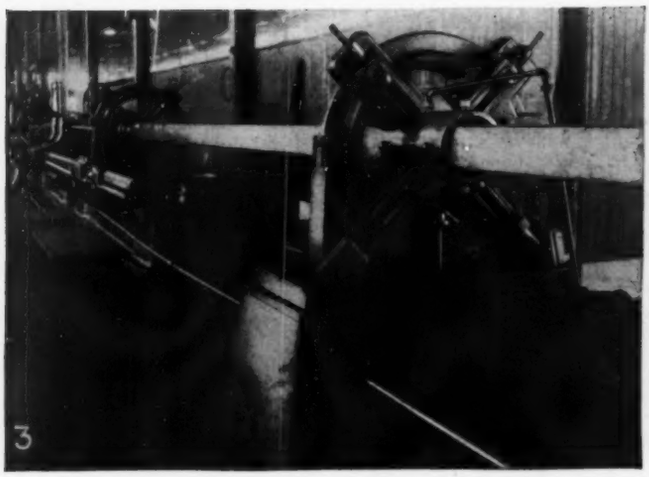
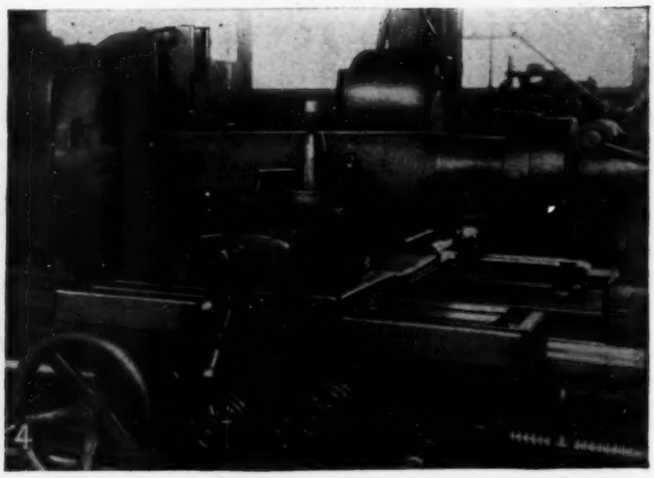


Fig. 2—The drill is made by welding a head to seamless-steel tubing, and the total length in this case is approximately 35 ft. The cutting tool shown at the right, which is of high-speed steel, is held by a setscrew. Bearing surfaces of Stellite are welded at intervals along the head back of the cutting tool. A drill with these Stellite pieces as been found to work better than the typical gun drill that was formerly used. The chips are cleared rapidly because the flushing compound has easy means of entrance and outlet





Figs. 3 and 4—These two illustrations, if considered as a single photograph give a clear idea of the method of holding and driving the shaft. At the left is the 42-ft. gun-boring lathe, and at the right the 28-in. lathe with the shaft extending through its spindle. It is driven by the four-jawed chuck, while the ball-bearing cap on the tailstock takes the thrust of the drill, which moves in the axial direction but does not rotate during the operation of boring

eight setscrews. Such a fixture is known as a "cat-head."

Constructional features of the boring tool are shown in Fig. 2. The body is of seamless steel tubing, and has the toolhead welded to it at one end. A slot at the head end is provided to hold the $\frac{5}{16}$-in. high-speed steel drill bit shown in detail at the right. The hook and clearance angles are important and may vary somewhat for different classes of work but the angles in use have been found most satisfactory for the grade of steel to be drilled. Bearing surfaces made of Stellite, welded into place and then ground to the hole diameter, are located a short distance back of the drill bit. These surfaces support and align the bar during drilling.

Usually, an operation of this kind is done with a gun drill having a body equal in diameter to the size of the hole, and made with a cut-away section equal to approximately one quarter of the body size. Several tools of this design were tried, however, and it was found that the chips did not "clear" satisfactorily. With such a tool it was necessary to interrupt the cut at intervals to clean out the chips. The present design eliminates this difficulty since there is ample chip-clearance, permitting the drilling to be done without disengaging the feed.

With the conventional form of gun drill the hole often ran out of true, and when the joining hole was drilled from the other end, the openings did not meet. These handicaps have not occurred since the revised design of drilling bar has been used, and from observation it seems that credit is due largely to the adequate removal of the chips.

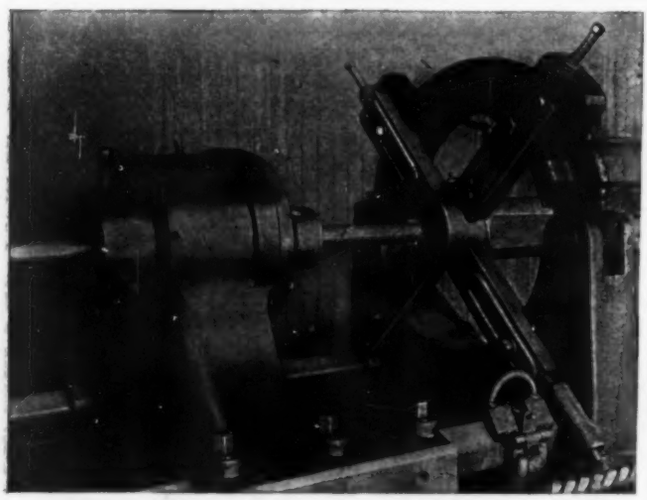


Fig. 5—The sleeve that is placed over the threaded end is used as a steadyrest bearing. The drill is held in place and guided by a chuck head as shown at the right

Cutting lubricant is forced to the cutting point through the body of the tool, coming out through the four holes at the tool head. This construction permits the lubricant to flush the chips back through the drilled hole, since there is sufficient clearance for them to pass without jamming. The edges of the drill bit are made with staggered notches so that the chips are well broken up.

In operation, the tool is held stationary and the work revolves, while feeding is done by advancing the tool into the work. The tool is held by a chucking head attached to the carriage of the machine and shown at the left in Fig. 3. When the tool has entered the work up to the point of chucking, the head is released, reset farther back on the bar, and then reclamped. As much as 15 to 20 ft. can be drilled at one setting.

Three operations are required to complete a kelly: (1) Thread one end in the 28-in. lathe and fit a sleeve over the threads for use with the steadyrest. (2) Reverse the work, thread the other end and drill the $2\frac{1}{2}$-in. hole half way through. (3) Reverse the work again and finish drill the center hole from the opposite end.

Starting the drill into the bar is done the same as for any ordinary drilling operation. The point of the drill is placed against the end face of the work, which has been center drilled for support during the cutting of the thread. The driving lathe is then started, and the carriage feed of the gun-boring lathe is engaged, causing the drill to feed into the end of the kelly.

Before using this method of drilling, experiments were carried out with different styles of tools and various forms of bits, but all seemed to offer trouble. Analyzing the present method there are three factors to which success can be attributed. These are: a sufficient amount and pressure of lubricant; adequate chip removal by avoiding clogging at any point; and revolving the work, not the drill. The production time per piece varies with the length of the section. The work revolves at 100 r.p.m., and the feed is at the rate of 5 ft. per hour. At this speed the drill stands up well, and a true, smooth hole is produced.

Limit Gaging—

Can an International System be Established?

By JOHN GAILLARD
Mechanical Engineer, American Standards Association

The final part of the article giving more formulas for determining the relationship of tolerances to nominal diameters of work, and permissible wear of gages

THE GERMANS have established the relationship between tolerances and allowances on the one side, and the nominal diameters of the parts on the other side, in a somewhat more general way by adopting a unit of measurement which they call the "unit of fit" (Passeinheit). This unit has a fixed relation to the nominal diameter, as follows: One unit of fit (in millimeters) $= 0.005 \sqrt[3]{d}$ (in millimeters), in which d = the nominal diameter of the part. Or, in inches, with close approximation: One unit of fit (in inches) $= 0.0006 \sqrt[3]{d}$ inches.

Each German grade of fit is characterized by a tolerance equal to a definite number of "units of fit" on the hole and on the shaft. This number need not be the same for the hole and the shaft. It is the same, however, for all holes of the same grade throughout the entire range of diameters, and also for the complete series of shafts of the same grade.

The adoption of the "unit of fit" facilitates the designation of the different grades of fit adopted by the German standard. This is shown in the diagram in Fig. 7, which represents the relative tolerances, expressed in "units of fit," for holes and shafts of the four German grades of fit. If mention is made on the bill of material for a certain product, for example, cold-drawn, finished-bar stock suitable to be used for shafting purposes, the manufacturing limits of such product are completely defined for all sizes concerned, by the simple statement that the products must be held within a tolerance of, say, "minus 3 units of fit" (it being understood that the tolerances must be unilateral). For example, a shaft having a nominal diameter 2.5 in. will then be given a minus tolerance of 0.0024 in., consequently, the limits will be 2.5000 and 2.4976 in., respectively.

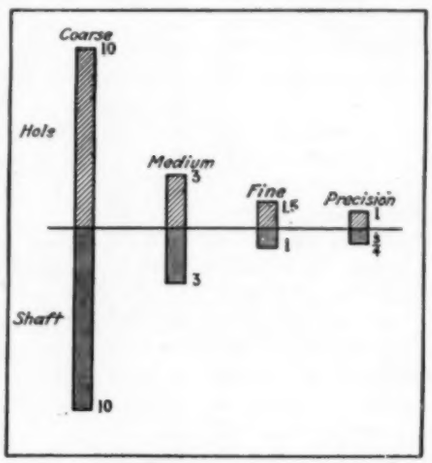


Fig. 7—Relations between four German grades of fit, expressed in units of fit

In several national standards, the allowances (minimum clearances or maximum interferences) of a series of fits of the same grade are a constant fraction of $\sqrt[3]{d}$ (Austria, Belgium, Germany, Holland, Italy and Norway), while in other standards they are based on a different root of d (Czechoslovakia, Finland, Poland, Sweden and the United States).

In establishing the British standard tolerances and allowances, it was found that in so far as clearance and transition fits are concerned, satisfactory values were given by the formula $b \sqrt{d}$, in which d is the nominal diameter, and b a constant depending upon the grade of workmanship of the mating parts. However, as this formula would give unduly low values for small diameters, it was found necessary to add a constant factor a, the general formula for clearance and transition fits thus becoming: $a + b \sqrt{d}$. Furthermore, it appeared that the allowance of interference fits could well be made proportional to the diameter, or equal to cd (c being a constant factor, the value of which depends upon the class of fit). The general expression for a tolerance or allowance in the British system thus became:

$$a + b \sqrt{d} + cd,$$

in which the values of the several constants again vary for the different classes of fits and grades of workmanship.

In Switzerland, no effort was made to establish an impirical basic formula, the national system being established directly by the selection of existing fits, or by the adoption of a suitable average between several existing fits.

In turning attention from the manufactured product, held between certain limits through inspection by means of limit gages, to these gages themselves, it is found that consideration must also be given to the inaccuracies that inevitably occur in the gages as a manufactured product. Inaccuracy of a gage is the deviation of its actual size from the value of that limit of the product which it must check. This value may be called the "nominal size" of the gage. For example, the width between the jaws of a "go" snap gage for checking the high limit of a shaft, say 1.0004 in., would have in the ideal case, exactly this value. It is evident, however, that a certain manufacturing tolerance must be allowed on this "nominal size," and also that such tolerance must be but a fraction of the tolerance on the product.

Another point to be kept in mind, is that the use of a gage (particularly of a "go" gage) causes it to wear, so that its actual size changes constantly and becomes unduly inaccurate in the course of time. With regard to the tolerance on, and the permissible wear of, gages, there is a distinct difference between the American standard and the Continental standards.

The American standard is very definite in stating that no variation in the size of a limit gage is permitted

Conclusion of the article.

Comparison of National Standard System of Fits

Country	Reference Temperature	Basic Hole (H) or Basic Shaft (S) System	Unilateral (U) or Bilateral (B) Tolerances	Number of "Grades" of Fits
Austria	20° C.	H S	U	Four
Belgium	20° C.	H S	U	Four
Czechoslovakia[1]	20° C.	H S	U	Five
Denmark[1]	20° C.	H S	U	Twelve
Finland	20° C.	H S	U	Twelve
France	0° C.	....	..	....
Germany	20° C.	H S	U	Four
Great Britain	62° F. = 16⅔° C.	H (and 3 "oversize" holes)	U and B	See[3]
Holland[2]	20° C.	H S	U	Three
Hungary	20° C.	....	..	.....
Italy	20° C.	H S	U	Four
Japan[1]	20° C.	H S	U	.....
Norway[1]	20° C.	H S	U	Four
Poland[1]	20° C.	H S	U	Five
Russia[1]	20° C.	H S	U	Four
Sweden	20° C.	H S	U	Twelve
Switzerland	20° C.	H S	U	Three
United States	20° C.	H	U	See[4]

[1]Proposed system had not yet been finally adopted on April 1, 1929.
[2]System under revision. New system had not been finally adopted on April 1, 1929.
[3]The British standard does not distinguish between "grades" of fit. It gives fourteen standard shafts, four basic holes and three oversize holes, which may be combined at will.
[4]The American standard does not distinguish between "grades" of fit. It specifies eight definite fits, the holes and shafts of which may also be combined in a different manner.

that might result in the acceptance of a product, the actual size of which is outside its own manufacturing limits. This means, first, that the manufacturing tolerances on the "go" and the "not go" gages required for inspecting the product, must lie within the tolerance on that product; and, second, that the use of a gage must be discontinued as soon as wear has brought its actual size outside the tolerance on the product.

Among the Continental standards, the German one may be referred to as a representative type. According to the German standard, a "go" gage is given a unilateral tolerance, which is measured from the nominal gage-size in a direction opposite to its wear. However, in a case where the "go" gage has worn down to its nominal size, the German standard permits continued use of the gage until it has worn to a certain small amount past this nominal size.

Limits for the wear of "not go" gages are not specified in the German standard, as this kind of gage does not wear to any appreciable extent. In fact, an internal "not go" gage does not enter an acceptable hole, nor does an external "not go" gage pass over an acceptable pin, shaft, or similar part. Also, possible wear of a "not go" gage cannot impair the correct fit between parts, as such wear can only reduce, but never increase, the tolerance on the product.

The difference between the American and the German principles may be illustrated by a concrete example, as shown in Fig. 8. A basic hole having a nominal size of 1.7500 in., intended to give an American standard medium fit with a shaft, has a tolerance of 0.0010 in., its manufacturing limits consequently being 1.7500 in. and 1.7510 in., respectively. If now, a tolerance of 20 per cent of this amount, or 0.0002 in., is given on the "go" and the "not go" gages, the positions of these tolerances may be, for example, as shown in the left-hand portion of Fig. 8. The actual tolerance on the product is thus reduced by the sum of the actual deviation of the "go" and the "not go" gages from their respective nominal sizes. In the example in Fig. 8, this reduction may reach a maximum of 0.0004 in., but there is always certainty that no product larger than 1.7510 in., nor smaller than 1.7500 in. will ever be accepted by the gages.

The tolerances on limit gages have not yet been laid down in a definite American standard. The value used here was taken from a proposed standard worked out, some time ago, by the sectional committee on "Methods of gaging and specifications for plain limit gages." This proposed standard has not yet been submitted for approval as an American standard.

A German basic hole of the fine grade has the same tolerance as that of the American hole mentioned above. According to the German standard, a unilateral tolerance of 5 microns (about 0.0002 in.) is given on the "go" gage, see right-hand side of Fig. 8, while a bilateral tolerance of the same value is given on the "not go" gage, namely, plus or minus 0.0001 in. The "go" gage is allowed to wear about 0.00024 in. (6 microns) past the low limit, or nominal size. Therefore, in the German system, the deviations of the gages from their nominal sizes may cause the actual tolerance on the product to be increased to a maximum of 0.00134 in. That is, by 34 per cent of the value originally adopted. It is, however, highly improbable that all conditions required for the occurrence of this increased tolerance will be fulfilled at the same time. For this reason, the Germans have taken the standpoint that the chance of causing an incorrect fit by an incidental accumulation of otherwise permissible deviations in the actual gage sizes, is negligible in practice.

With regard to the limiting dimensions of gages, the British standard is based upon the same principle as that of the American, in so far as it specifies that the manufacturing tolerances on *working* gages and their permissible wear, must be given in such a way as to keep the product within its own limits. The tolerances on *inspection* gages, on the contrary, must be given outside the limits of the product, according to the British standard. In this condition lies, of course, a chance that a product slightly outside its limits may be accepted by its inspection gages, but as the submission of such a product cannot occur, in principle, without the *working* gages being unduly off-size, the British standard may be said to work out in practice in the same ways as does the American standard.

The designation of fits by names may be standardized just as well as by their numerical characteristics. The American and the German national standards include such standard nomenclature. In several standards, a

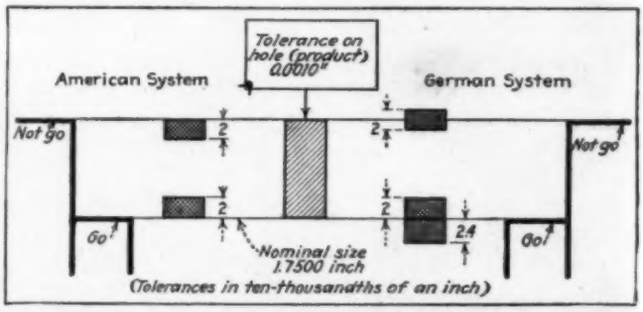


Fig. 8—Tolerances on gages and their permissible wear

designation by symbols consisting of letters or numerals, or a combination of the two, has been added as an alternative for easy reference to the fits, on drawings, etc. In some standards, such as the British and the Swedish, the fits are designated by symbols exclusively.

Designation of a fit by name, such as "tight fit," has the advantage of giving the designer or the workman a direct general impression of the nature of the fit. However this impression will have a different significance in different people's minds, as the requirements of the trade, the judgment and the designation of the different fits, vary widely in the several branches of the mechanical industry. A great diversity in nomenclature has, therefore, grown up, even in workshops devoted to the same branch of manufacture. Evidently, a fit called "snug" in a rather coarsely-finished product, may be called a

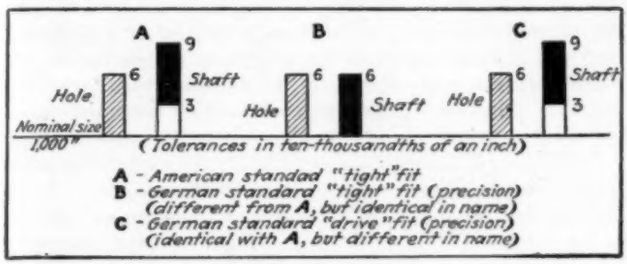


Fig. 9—An example of discrepancy in nomenclature

"free" fit by the designer of a product that must be finished in accordance with higher standards of precision. Therefore, designation by symbols that will do away with the possibility of confusion between names, is a very desirable thing. It is particularly desirable in cases where a national standard system is being introduced into an organization that so far has been using its own system of fits, including its own special nomenclature, which then becomes obsolete.

As might be expected, there is international discrepancy in terminology, a situation which, of course, assumes special importance when the possibility of an international standard system of fits is considered. A striking illustration is given in Fig. 9, which shows that an American standard "tight fit" *A* is different from a German "precision fit" *B* having the equivalent name (Festsitz). Incidentally, the American "tight fit" *A* does correspond exactly to the German "precision fit" *C* designated by the name "drive fit" (Treibsitz).

If international agreement can be reached on the numerical values of the tolerances and allowances of a series of standard fits, it would seem that it would be comparatively easy to settle the question of standard nomenclature, or designation by letters or numerals. There may be experienced some difficulty (common to all changes in usual practice) in the individual workshop. However, it should not be forgotten that as in practice, a system of fits is to a great extent laid down physically in the limit gages used, its application by the workmen and the inspector is largely independent of terminology. For the designer who has to mention fits on drawings, it will be easy to consult the tables of the new standard. Gradually, the standard nomenclature will thus become rooted in everyone's memory.

Designations of the fits by letters, numbers, or a combination of the two, are given in all existing, or proposed national standards.

A summary of the principal features of the national standard systems of fits now adopted, or under consideration for adoption in eighteen countries, is given in the accompanying table.

The present status of the international problem appears most clearly from the decisions made at a conference held in Prague, Czechoslovakia, in October, 1928, where the report prepared by the German organization was discussed by representatives of fourteen national standards committees, Austria, Belgium, Denmark, Cezchoslovakia, France, Germany, Holland, Hungary, Italy, Norway, Poland, Russia, Sweden, and Switzerland. At this conference, it was unanimously agreed that the data, as collected and digested in the report, proved that the establishment of a uniform international system of fits was not only desirable, but also feasible. It was realized that the transition to a revised system would entail certain difficulties for those countries in which a national system had already been adopted. In connection therewith, it was stipulated as a requirement of any international system of fits to be established, that it provide to the largest extent possible, for practical interchangeability with existing national standard systems. The delegates of the several countries agreed to recommend to their national industries that they accept, in principle, the difficulties incident to a possible future transition, for the sake of international uniformity.

It was decided by the Prague conference, that the first step toward the solution of the international problem would be made by having a proposal for an international system drafted by a committee consisting of the delegates from the following five countries: Czechoslovakia, France, Germany, Sweden and Switzerland. A proposal for an international system, worked out after a careful study of the existing national standards by the French engineer, Le Besnerais, was submitted to the conference as a basis of discussion.

Wire Gages Again—*Discussion*

By R. H. Kasper

Master Mechanic, Steel Heddle Manufacturing Company

THE editorial on page 1022, Vol. 70, of the *American Machinist*, on the subject of wire gages, prompts me to state my experiences in ordering music wire. At one time, my method was to order wire sizes in decimals of an inch. Invariably, the wrong size was delivered. I then ordered by gage number, with the decimal dimension in parentheses. This worked out better, but I received a letter from the wire manufacturer, enclosing a table of gage sizes, requesting that I order by number only. Now I always receive the size I order.

Why there should be confusion when the size is ordered in decimals, I do not know. However, I believe there is one advantage in ordering by gage number. The average user of music wire is not sufficiently acquainted with the gage sizes to order without consulting the table. As the table indicates the sizes which are considered standard, there is less possibility of ordering a non-standard size, assuming, of course, that the correct table is consulted.

Brass plugs screwed into aluminum have a tendency to stick after they have been in place for some time. A thin coat of a paste made of powdered graphite and castor oil will prevent this tendency to seize.

Visualizing the Stresses in Gearing

Discussion

By James R. Cornelius
Coventry, England

ON PAGE 393, Vol 70, of the *American Machinist*, H. L. Bradford described an apparatus for visualizing and determining the tensile stresses in gearing, in which full-sized teeth made of ¼-in. pyrolin are viewed by the split rays of polarized light.

Perhaps Mr. Bradford does not know that there exists an apparatus for disintegrating speeds by means of interrupted light. In this apparatus, the actual teeth of running gears can be seen by the naked eye while under strain at any speed and under any load, without the substitution of any transparent material. This apparatus is not confined to testing gear teeth only, but may be used for an infinite number of other bodies. Belts, and chains (under constant load and at constant speed), transmissions, crankshafts, entire automobile engines, axles, flywheels, aeroplane engines, propellers, etc., come within its scope.

A diagram of the machine is shown in the illustration. It consists primarily of a device for projecting light rays at a predetermined frequency upon revolving, or oscillating bodies.

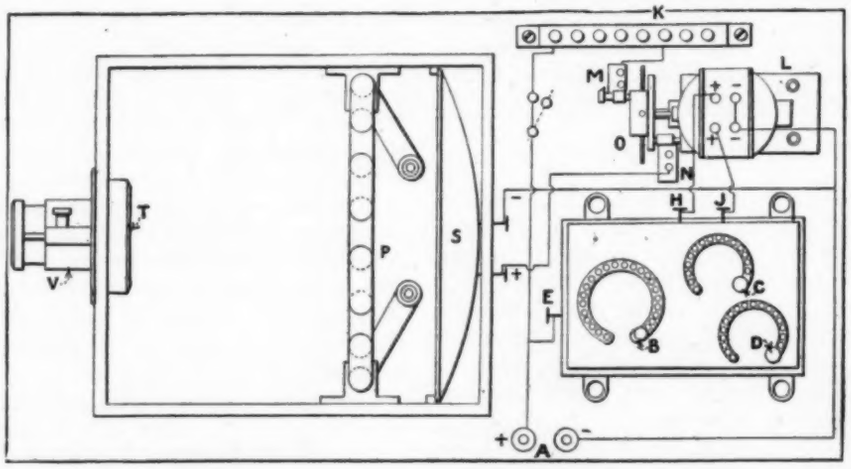


Diagram of apparatus for disintegrating speeds

The light source in this apparatus is a mercury-vapor lamp of special design. The tube is coiled in the focus of a reflector that throws the light onto a condenser similar to that used in a stereopticon, or in a photographic enlarging apparatus. The whole is situated inside a light chamber, the only exit for the rays being through the condenser. Immediately in front of the condenser is situated the projecting tube containing several lenses that are adjustable along the axis of the light rays leaving the condenser. By their adjustment, the rays are dispersed over a varying area, and cover any size of machine within their range without any waste of light.

Behind the chamber is situated the controlling gear. Its function is to control the frequency with which the successive rays of light leave the chamber. It consists of a base, upon which are mounted the motor and various switches and rheostats, lamp and its resistance coils. The main terminals are at *A*. *B* is the rheostat for the minor field-resistance of the motor. *C* is the rheostat for the major field-resistance of the motor. *D* is the rheostat for the armature coils. *E* is the positive terminal for the rheostat. *H* is the terminal from the rheostat to the motor. *J* is the terminal from the rheostat to the armature. *K* is the resistance for the lamp. *L* is the motor. *M* is the resistance-side brush for the lamp circuit. *N* is the lamp-side brush. *O* is the commutator for the lamp circuit. *P* is the mercury-vapor lamp. *S* is the reflector for the lamp. *T* is the condenser, and *V* is the adjustable lens-tube.

The motor spindle carries two commutators. One for the armature, and the other in no way connected with the motor windings. It is through the latter connection that the current passes from the lamp resistance before passing through the lamp itself. Two brushes are fitted for this purpose. The commutator has but four bars. Each opposite pair being connected; thus for every revolution of the motor, four connections are made between the two brushes. It will be seen that while the motor is revolving at, say, 400 r.p.m., the circuit through the lamp is made and broken 1,600 times in that period. The lamp being extremely sensitive, its light is intermittent, passing through the condenser regularly at the speed of 1,600 beams per minute.

If now an airplane engine is placed in the focus of the lenses, setting the motor so that contact is made between two bars of the lamp commutator, the engine will be lit up by the rays from the lamp passing through the various parts of the apparatus. All other means of access of light being closed, a photograph could be taken of the engine as if it was in a photographic studio. When the speeds of the engine and of the motor are synchronous, the engine appears to be stationary, and but one point of its cycle of revolution can be seen. The position of the engine, as now seen, corresponds with the position of the brushes on the motor commutator.

For gears, the test illustrated in Mr. Bradford's article can be quite easily made with this apparatus, not with celluloid, but with the actual steel or iron gears themselves. For the simple deformation of the tooth shape under load, the photographic test will suffice without any preliminary operations other than cleaning the parts to be tested. If, however, the structural deformations of the fiber are to be observed, the teeth faces should be polished and etched so that the fibers appear well pronounced. A photograph should be taken of the gear before the test, and others should be taken during the test at different angles in the cycle.

Twin-Unit Machines for Multiple Production

By F. H. MAYOH
Designing Engineer, Package Machinery Company

Machines with either multiple spindles or two tables for operating on more than one piece, or on several parts of one piece in sequence

IN ARRANGING for increased production, there has been developed within comparatively recent years a trend toward grouping multiple units in one machine as a means to that end. Developments along these lines, together with some of the machines and set-ups used for this purpose, are brought out in this article, with particular reference to milling-machine development. Milling machines have proved to be quite adaptable to multiple-spindle and dual-table arrangements for the purpose of increasing production.

An early design of a machine equipped with two tables is the planer shown in Fig. 1. The machine is of the screw-operated type and was patented by F. R. Patch, Sept. 3, 1901. The bed has two sets of guide rails, both of which are indicated at *A* in the plan view. Two separate tables *B* are mounted on the rails and are operated by screws, through bevel gears, each screw having a separate drive, the object of which is to permit each table to be operated independently, so that different pieces mounted thereon could be planed. In the illustration, however, the two tables are shown connected by tiebars so as to be operated as a unit, through a clutch on the ends of the driving shafts. The clutch is disengaged when the tables are operated independently. When the clutch is engaged, both tables will be driven in unison, as one member is on each driving shaft. It is not known that this type of planer was ever marketed, but it is unusual in design and shows an early tendency along dual-production lines. It is a forerunner of present types.

In striking contrast to the foregoing machine is a development in dual-production milling, where the table of the machine is placed between two heads carrying opposed spindles. Such a machine is shown in Fig. 2, and is built by the Kearney & Trecker Corporation for quantity work.

The bed is of very rigid construction and the table may be traversed in either direction. Side milling cutters are mounted on arbors carried in the spindles *A* and *B*. Each head has two overarms, those in each head being connected by brackets. Both heads are adjustable in a direction at right angles to the table and the spindles can be adjusted vertically. Other combinations of this machine are built with vertical spindles.

An example of milling by the use of this general type of machine is shown in Fig. 3. In this set-up, five bosses on the sides of a cylinder block are milled by cutters held in the spindles of both heads. The cutters *A* and *B* are mounted on arbors held in auxiliary spindles, while cutter *C* is carried by an arbor in the main spindle of the left-hand head. This machine can be constructed

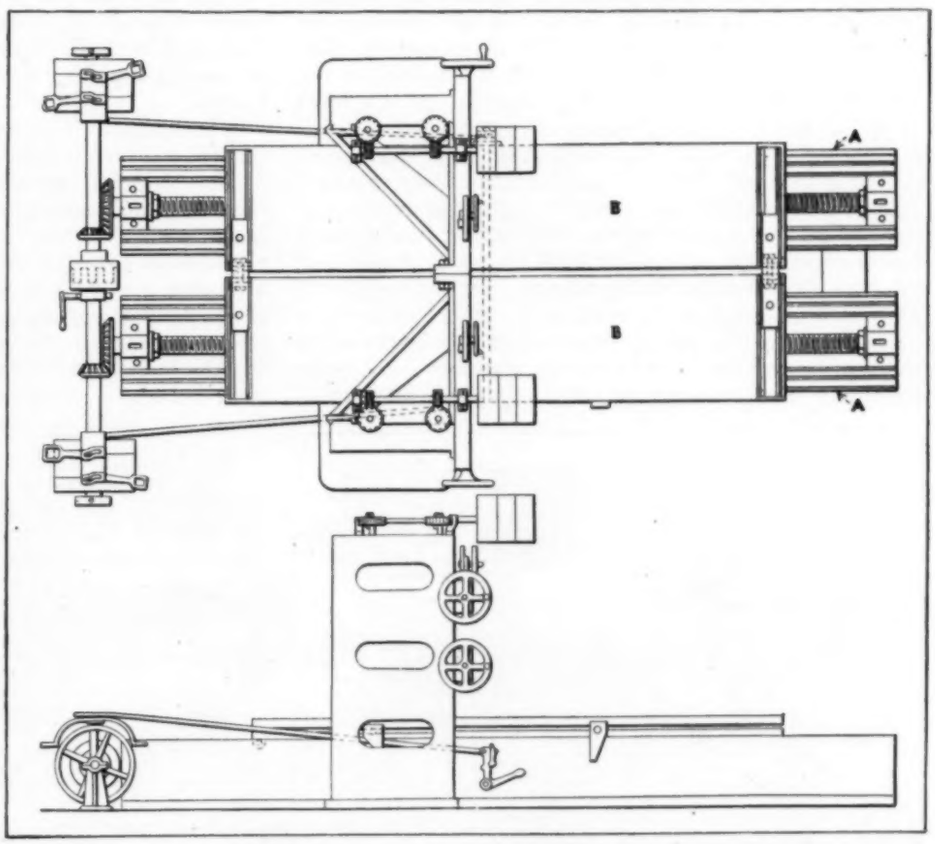
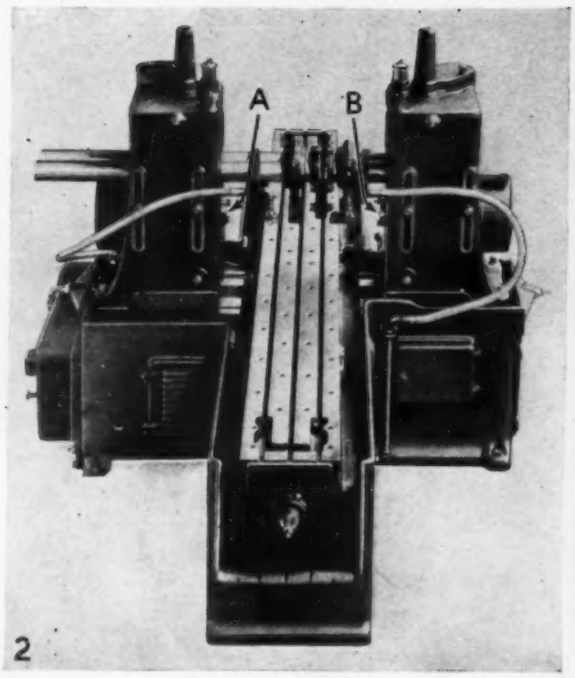


Fig. 1—An early type of planer with two tables. The tables were capable of attachment together by tiebars and operated as a single unit, or they were operated separately as desired. In striking contrast to this is the design used in the modern dual-type milling machine



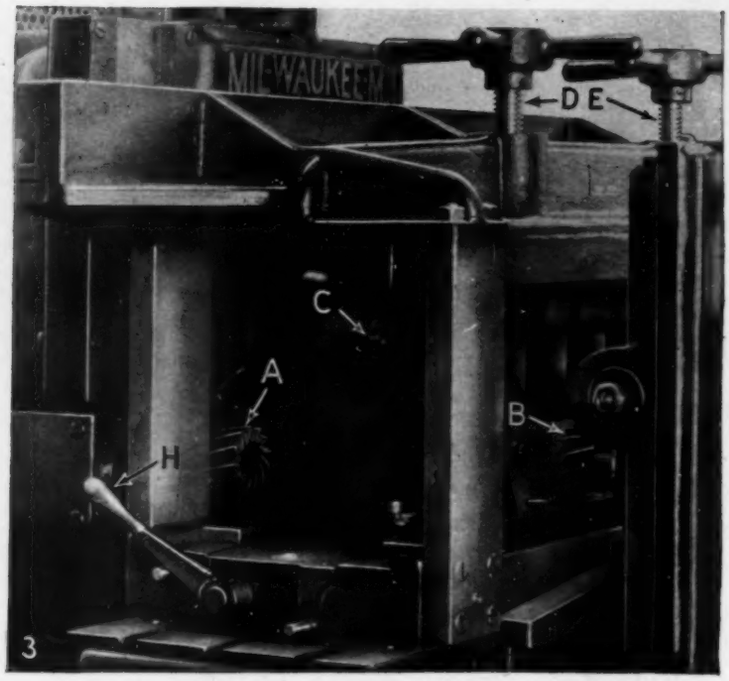
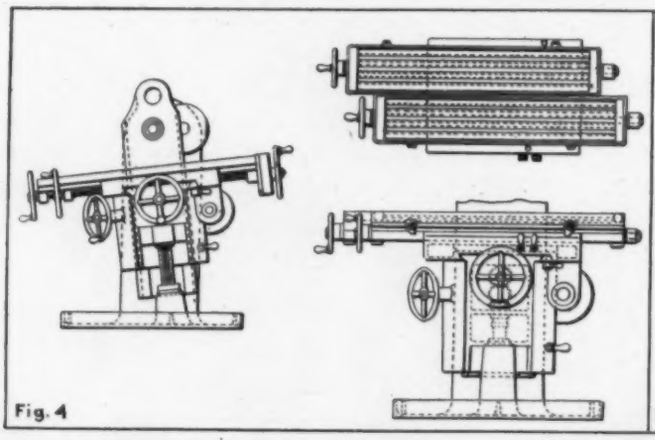


Fig. 2—Milling machine with opposed spindles, one on each side of the table. The table can be traversed in either direction. Each head has two overarms and both heads are adjustable at right angles to the table. The spindles can be adjusted vertically. The machine can be built with either horizontal or vertical spindles. Fig. 3—An example of milling on the machine shown in the previous illustration. The bosses on the sides of the cylinder blocks are being milled

so that the spaces between the bosses can be traversed quickly, when the cutting feed will be automatically resumed. By this arrangement there will be no lost time between cuts. Incidentally, certain of the spindles can be arranged to move automatically in or out to clear projections on the work. The work is clamped in the fixture by screws *D* and *E* in combination with the lever *H* at the bottom of the fixture.

Another type of dual-production milling machine is shown in Fig. 4. This machine has two tables mounted side by side. Each table carries a fixture and two similar cutters are mounted on the cutter arbor, being spaced the same distance apart as are the fixtures. Since each table can be traversed independently, one fixture can be loaded or unloaded while work in the other one is being machined. In this way, production can be increased to the same extent as if two separate machines were being operated. However, the production on this machine is not limited to the performance of the same work on both tables, as roughing can be done on one table and finishing on the other, or a different type of work, using a different group of cutters, can be set up on each table. One fixture can be loaded or unloaded while work in the fixture on the other table is being operated upon by the cutters.

An additional feature (not shown) of this dual-production machine is that both tables can be geared together so that they will operate as a unit on heavy work. The inclined-table feature, shown in the left-hand view, is an advantage in chip removal, and also (based on the assumption that the tables always feed from right to left when the work is under the cutters), the weight of the tables being downward, the angular upward-feeding tends to neutralize the hogging effect of the cutter action, thereby reducing chatter. The machine is unusually efficient for small- and medium-sized work. The knee car-



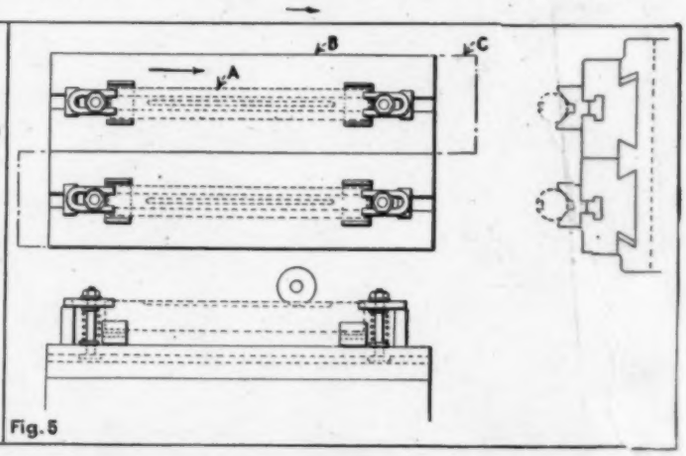


Fig. 4—Milling machine equipped with two tables. Fixtures are mounted on each table and two similar cutters are held on the cutter arbor, being spaced the same distance apart as the fixtures. Fig. 5—Diagram of the method of doing the work on the machine shown in the previous illustration. The two tables can be operated singly or together

rying the table can be raised or lowered by a handwheel in the usual manner. Also, the machine can be fitted with a head carrying a vertical spindle, if desired.

An illustration that brings out a method of performing work on this machine is shown in Fig. 5. It indicates how such work as the splining of shafts, or the cutting of keyways of various kinds, can be done. The shaft *A*, on table *B*, is held in V-blocks at each end by clamps. As soon as the shaft has been clamped in place, the operator starts the table to feeding in the direction of the arrow. The table will perhaps have reached the position shown by the dot-dash lies at the right before the

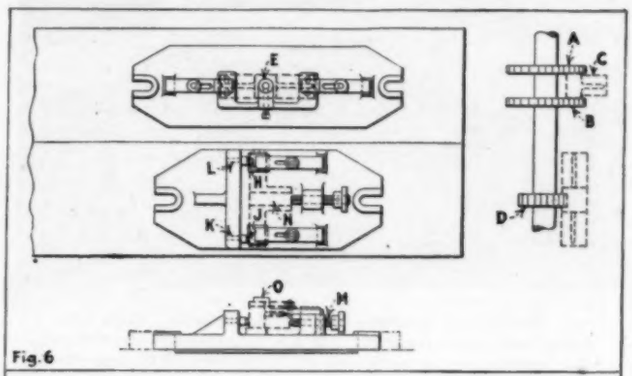


Fig. 6

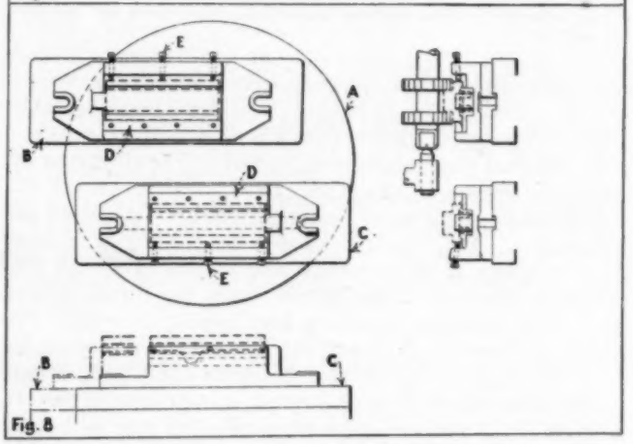


Fig. 8

Fig. 6—Another set-up for a machine with two tables. In this case, different operations on the same piece are performed on each table. Fig. 8—Diagram of turret, tables and set-up

operator has finished loading another shaft in the V-blocks on the other table. As soon as this second shaft has been clamped in position, the cut is started. Springs in contact with washers raise the clamps clear of the work as soon as they are released, and it is necessary only to slide the clamps back to remove the work. The operator can very quickly load the fixture on one table while work in the fixture on the other table is being milled. Thus, dual production can be obtained with this set-up without the operator having to move from the machine.

The fixture and the arrangement of the cutters illustrated in Fig. 6 indicates another way of using this two-table set-up by having both tables feeding side by side. Two different operations on the same part can be performed by the use of two fixtures acting in combination with different cutters, each fixture being mounted on a different table. By referring to the illustration it will be seen that three cutters are mounted on the arbor. Two of the cutters, *A* and *B*, mill the sides of the part shown at *C*, while cutter *D* mills a slot in the same part. The finished sides of the part previously milled on the other table are used for locating purposes in the second operation.

Referring to the rear table and its set-up, the work is located in the fixture so that the rib comes between two pins set close enough together to prevent it from moving sidewise. The lower surface of the work rests on these pins, and two clamps are used to hold it down on them. A spring jack at *E*, locked by a screw, supports the work under the center. As soon as the part has been clamped in the fixture the operator starts it under the cutters. Immediately thereafter he takes another part and places it in the fixture on the front table, resting it on surfaces *H* and *J* and forcing it against the pins *K* and *L*, using the screw *M* to hold it. The work on this table is then started under the cutter *D*, and the groove *N* is milled. Thus, two different kinds of operations are performed on this machine by loading the fixtures alternately as rapidly as the operator can handle the parts. It will be noticed that the clamp *O* is in the shape of a goose neck, so that the nut on its screw will pass beneath the cutter arbor without interference. While these illustrations show horizontal milling, by mounting two vertical heads in tandem, work adapted to vertical milling can be handled on the dual tables in the same continuous manner.

A type of milling machine having some of the advantages obtainable in the foregoing machine is illustrated in Fig. 7. In this machine, the dual tables are mounted on a turret. Upon the completion of the cut on work mounted on one table, the operator steps on a treadle,

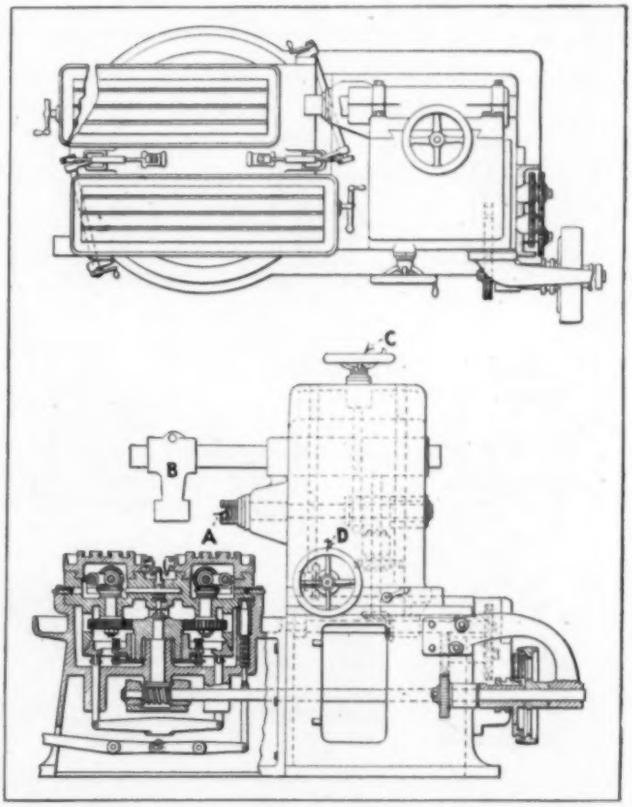


Fig. 7—Machine having two tables mounted on a turret. After the cut on the work on one table has been completed, the turret is indexed, bringing the work on the other table into cutting position

causing the turret to index 180 deg. and changing the relative positions of the tables. The work just completed on one table can be unloaded while the work on the other table is passing under the cutters. With this method of milling, the operations on the work on both tables must be alike, as but one set of cutters can be used. No attempt is made to save on the actual cutting time, though there is considerable saving through the loading or unloading of the work in the fixture on one table while work in the fixture on the other table is being milled. This saving is more apparent where considerable time is required to clean out the chips, put the work in the fixture and clamp it.

Referring to the illustration, the spindle is indicated at *A*, while at *B* is an arm for supporting the outboard end of the cutter arbor in the usual manner. The spindle is mounted in a vertical slide that can be moved up or down by means of a screw operated by the hand wheel *C*. A crosswise adjustment of the head is obtained by means of a rack and pinion operated by the handwheel *D*. The machine is driven by a pulley, operating through shafts and trains of gears to revolve the spindle and to traverse the tables. The turret is located in the proper radial position by means of an index pin through the medium of levers connected to a treadle.

A clearer understanding of the method by which milling operations are performed on this machine will be obtained by referring to Fig. 8. The circle *A* indicates the turret on which the two tables, *B* and *C*, are mounted. Referring to the end view at the right, the straddle mills are shown in position for milling the work, the outer end of the cutter arbor being supported by a center in the overarm. The work in the fixture on table *B* is fed in the direction indicated by the arrow and the surfaces shown in contact with the cutters in the end view are

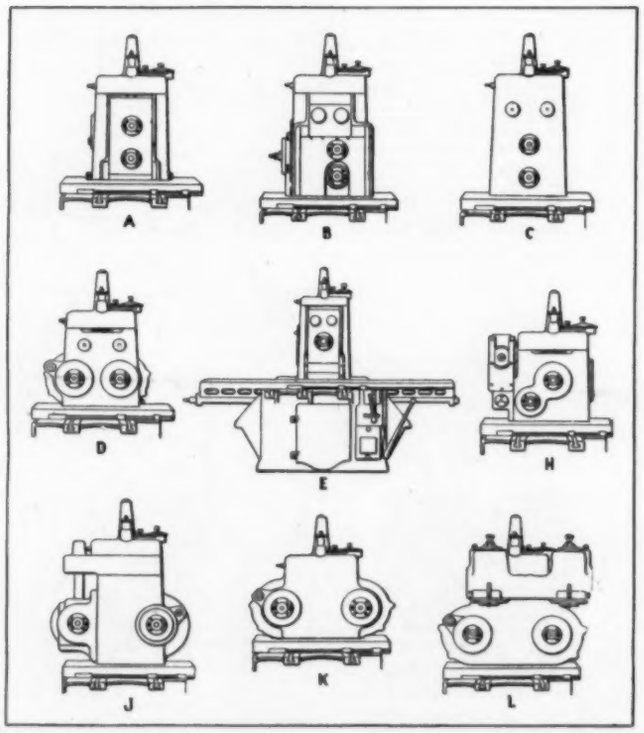


Fig. 9—A group of milling machine heads showing many different combinations of spindle and overarm arrangement. In some of the heads the spindles are adjustable vertically as a unit, while in others one of the spindles is independently adjustable

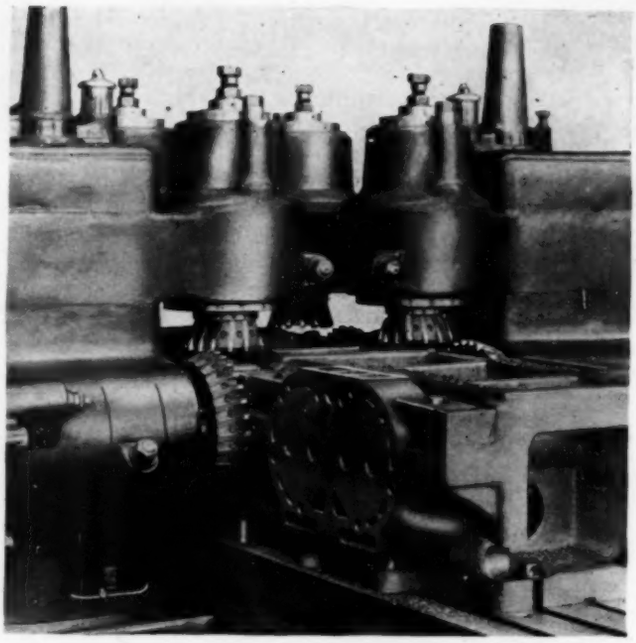


Fig. 10—Milling machine with eight spindles, four horizontal and four vertical. All the spindles are carried in two heads, one on each side of the table. With spindles so arranged, work can be milled on three sides at one setting

milled the entire length of the piece. At the completion of the cut, the turret is indexed 180 deg., bringing table *C* into the position where table *B* is shown in the illustration. In that position, it will be fed in the direction of the arrow shown on the other table.

For holding the work, identical fixtures are used on both tables. The work is located by forcing it against the steel plate *D* by means of the screws at *E*. A lug located at the end of the fixture takes the thrust of the cut. This machine is at its best advantage when the length of time required to load and secure the work in the fixtures nearly equals that required to do the milling.

The illustration, Fig. 9, shows spindle arrangements in some of the numerous combinations that may be had in the machine shown in Fig. 2, whether the machine is equipped with single or multiple spindles. At *A* is a head having two spindles, one directly above the other. The spindles are adjustable vertically at a unit, but not independently. At *B* is a head carrying two spindles, one directly over the other, and two overarms. Both spindles are adjustable independently in a vertical direction. Another arrangement of two spindles and two overarms is shown at *C*. Both the spindles and the overarms have fixed centers. A head having two spindles side by side, and two overarms, is shown at *D*. At *E* is a general view of a milling machine equipped with a single spindle and two overarms. At *H* is a head having two staggered main-spindles and two auxiliary spindles at the side. In the head shown at *J*, the spindle at the right is fixed, while the one at the left can be adjusted vertically. At *K* is a head having two spindles set widely apart.

In the machine shown in Fig. 10, four horizontal and four vertical spindles are in use in milling three sides of the work to be seen in the fixture. The spindles are all carried in two heads, one on each side of the table. But three spindles of each kind can be seen, the others being hidden by the head at the left. The spindles are independently adjustable in their own housings.

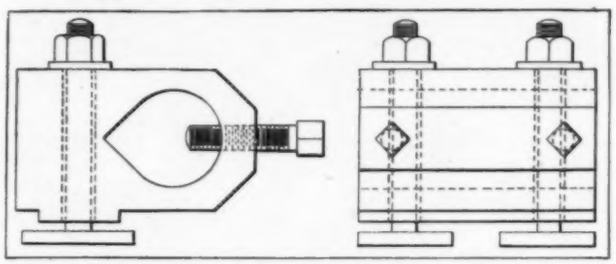
IDEAS *FROM PRACTICAL MEN*

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

A Boring-Bar Holder for the Lathe

By Albert Feucht

In the illustration is shown a boring-bar holder for use in a lathe. It furnishes a rigid mounting for boring bars of any diameter within its capacity. Since the V-notch is at the same height as that of the center of the lathe spindle, the bars will be automatically located



Boring-bar holder for the lathe

at the proper height. The holder is held on the tool-block by two bolts, the square heads of which engage the T-slot ordinarily used for the toolpost. One advantage of the holder is that the boring bars can be set to extend any distance to suit the depths of the holes to be bored.

Centering Eccentric Work Accurately

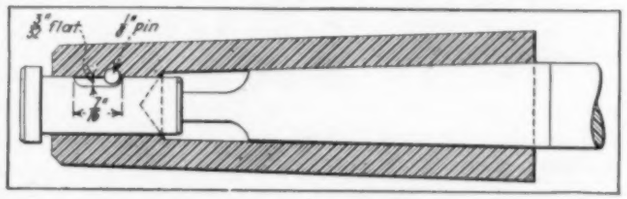
By Arthur Fetter

When centering eccentric mandrels or other work upon which more than one set of centers is required, the average mechanic generally resorts to a painstaking layout and centers his work in the drill press. Such work may be performed in about the same time and with considerable more accuracy by using the following method: The piece of stock to be centered is held in a swivel vise in the milling machine with one end towards the spindle. A drill chuck and center drill are inserted in the spindle and lined up approximately with the center of the work. Any center holes required may now be located by the feed screw graduation and then drilled. To center the opposite end of the work, the vise is swivelled 180 deg., the approximate center of the work is found again, and the remaining holes are located and drilled.

Knockout Plug for a Taper Socket

By H. L. Wheeler

In using taper-shank tools in a lathe, they are generally held in a taper socket in either the headstock or the tail-stock spindles. With the ordinary socket, when a tool



Taper socket fitted with a knockout plug

is to be removed it is necessary to remove both the socket and the tool from the spindle, and to free the tool from the socket by the use of a drift, which is not always at hand when wanted.

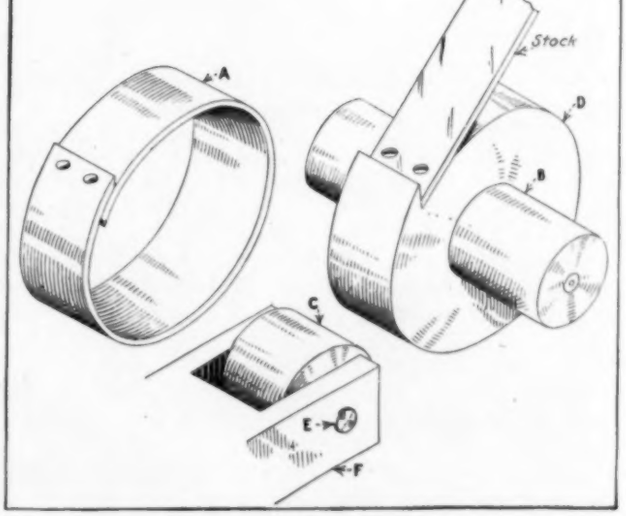
With a socket fitted with a knockout plug, as shown in the illustration, the tool can be removed from the socket without the use of a drift, and often without removing the socket from the spindle, depending upon which fits the tightest—the tool in the socket or the socket in the spindle. Should both the socket and the tool come out of the spindle together, the tool can be freed from the socket by striking the end of the knockout plug with a soft hammer, or by striking it against the bench.

Fixture for Rolling Rings

By Chas. B. Irmer

Superintendent, Direct Oxidation Process Corporation

RECENTLY we were confronted with the problem of making several hundred rings of the type shown at *A* in the illustration. The material used was $1\frac{1}{2}\times\frac{1}{16}$ in., and the ring was 6 in. in diameter. Not being equipped



A ring and the fixture upon which it was rolled, the roll being held between centers, in an engine lathe

with the conventional metal rolls used by tinsmiths, we built our own tools for performing the rolling operation. The device consisted essentially of the rolling disk *D* carried by the mandrel *B* supported on the centers of an engine lathe. The roller *C* was carried by the support *F* which was rigidly secured in the toolpost of the lathe.

In using the device the stock was first cut to length and punched for the assembly of the rivets, and was then screwed to the rolling disk *D* with round-head machine screws. The strip was held against the disk by the roller *C* which was positioned to make proper contact while the disk was rotated. The disk was undercut at the point where the stock was attached, so that the small roller would clear the machine screws in the course of the operation. The rolling disk *D* was 6½ in. in diameter so that the stock would not lap when the rolling operation was completed.

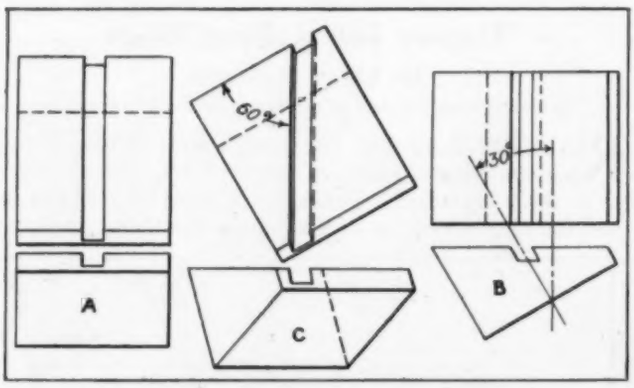
After the ring was rolled it was riveted, using a piece of 4-in. pipe as a mandrel, and it was then trued up on the same mandrel with a mallet. The parts necessary for the work were simple, were made quickly, and functioned satisfactorily.

A Problem in Shaper Work

By James Henderson

Toronto, Ontario, Canada

Small jobbing shops are frequently confronted with problems that tax the reasoning powers of their foremen. Some time ago we were faced with an apparently simple piece of shaper work that required considerable thought before operations were commenced. The job



The block in different positions

consisted of a 12-in. square cast-iron block to be finished all over, the sides to be perpendicular with the base, and the top to be inclined at an angle of 30 deg., the front and rear faces forming parallograms.

On the top face of the block a groove had to be cut, the sides of which were to be perpendicular to the base and the bottom to be parallel to the top face of the block. The groove was to be cut diagonally across the face of the block at an angle of 60 deg. with the front and rear faces. The problem was to find the angle to set the shaper head to cut the groove according to the specifications noted above.

The elevations in the sketch illustrate different positions of the block when held in the vise with the top face parallel with the shaper table. The reasoning was as follows: with the groove running at a right angle to the front and rear faces, as indicated at *A*, the head would be vertical. With the groove parallel to these faces, as indicated at *B*, the head would have to be inclined 30 deg. to keep the sides at a right angle to the base. By swinging the shaper vise around to bring the block into position for cutting the groove at an angle of 60 deg., the angle of the shaper head would have to be somewhere between the vertical and 30 deg.

When the block was in the position *A*, the head would be vertical; when it was in the position *B*, it would be inclined 30 deg.; therefore, the inclination for position *C* would be:

$$90 : 30 : : 30 : x, \text{ or}$$

$$x = \frac{90 \times 30}{90} = 10 \text{ degrees.}$$

A Rapid Oiler for Instrument Bearings

By G. B. Shaw

An extremely useful "oil pencil" for clock and instrument assembly work is shown in the accompanying illustrations. It was devised at the plant of the William L. Gilbert Clock Company. Formerly the pivot bearings

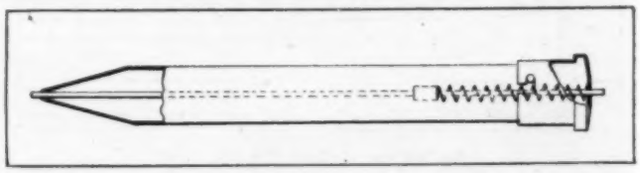


Fig. 1—Pencil for oiling small bearings

were oiled in the assembly department by dipping a small stick in oil and applying a drop to the bearing. This was a slow process, and it required numerous movements to oil all of the pivots in a single clock.

The pencil is made of brass tubing spun to a point at one end, as shown at Fig. 1, and having a metal cap on the other end. A steel wire plunger runs through the tube, and is pushed forward by a light coil spring so that the end protrudes through the point of the tube. When held down by the spring, the hole is completely obstructed by the wire so that no oil leaks out, but when the point is touched to the bearing, the plunger is pushed back

Fig. 2—Rapid oiling operation in clock and instrument assembling

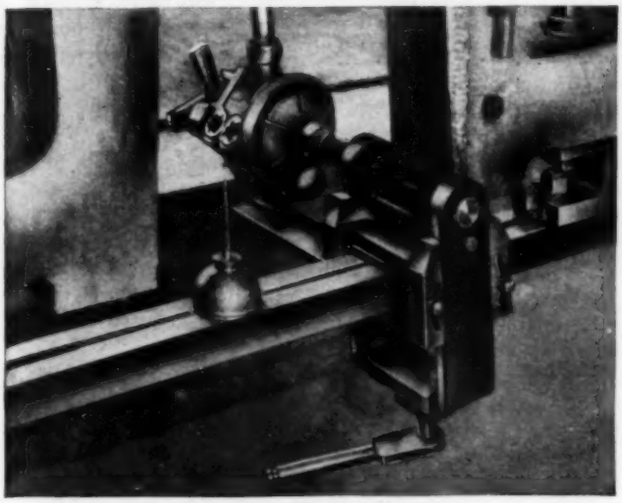
slightly and a drop of oil is left on the pivot. The operation of oiling clock bearings is shown in Fig. 2. With this tool production was increased greatly, and a laborious and tedious job was made easy for the operators.

Portable Miller for Pedestal Toes

By R. B. Loveland

Chipping and filing pedestal toes on locomotive frames after they have been built up by acetylene welding, is a very slow and tedious job. For this work, the portable miller shown in the illustration was built.

The machine is mounted on a bar attached to the under



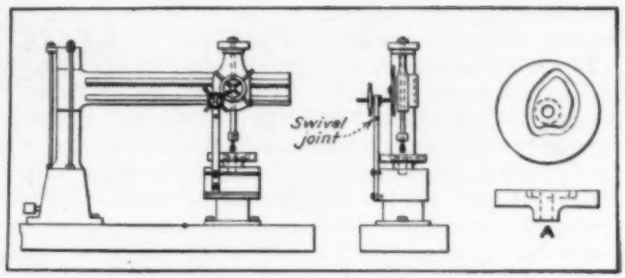
Portable miller for locomotive work

side of the frame by bolts fitting the holes tor the pedestal cap. Distance blocks are interposed between the bar and the frame, so that the cutter can be brought to the bottom of the toe to be milled. The machine itself comprises a head arranged to slide on the bar for adjustment, and having steel guides to which a yoke carrying the cutter is fitted. The guides have circular slots, through which pass the bolts for attaching them to the head. By this arrangement the yoke can be swiveled several degrees either side of the vertical, so that the toes on both frames can be milled to the proper angle. A feed screw at the bottom is connected to the head by a ball joint. The feed nut is attached to the yoke by a swiveling bearing. A bracket on the far side of the yoke supports the air motor for driving the cutter. So that the milling can be done from the bottom up, on the toes of either frame, a reversible motor is used, together with right- and left-hand cutters.

Cutting Cams in a Radial Drill

By W. H. Peach

We had an order for two cams such as the one shown at *A* in the illustration. As we had no milling machine suitable for the job, we decided to cut the cams in our radial drill, and rigged up as follows: A 2-in. steel bar was attached vertically to the table of the machine. At the top of the bar was a swivel yoke through which passed a long screw pivoted to the radial arm. The nut



Radial drill rigged up for cutting cams

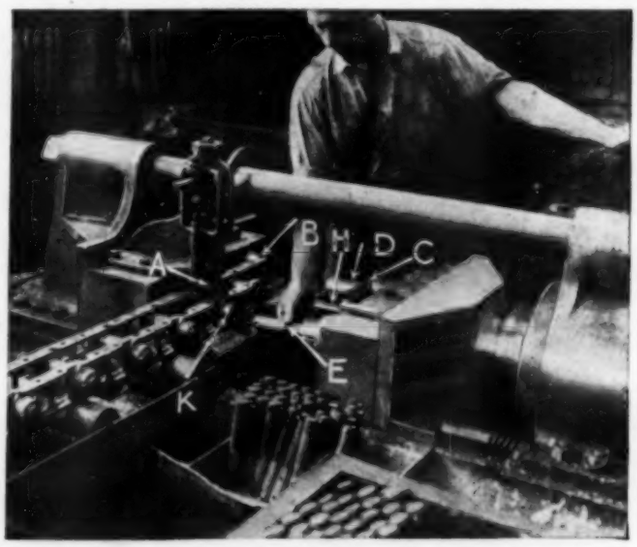
for the screw was attached to a handwheel and was grooved to fit the yoke. The sketch shows the arrangement. Since the drill head could be moved along the arm by the usual means, and the arm could be swung about the column a limited amount by the screw and nut, it will be seen that a cutter in the spindle could be moved in any direction at will, and that the amount and direction of motion could be controlled.

By the combination of these two motions, the cutter was made to follow the lines laid out on the cam blank clamped to the table.

Assembling Chains for Tractor Treads

By Herbert F. Crawford

The illustration shows a special hydraulic press that is used by the Best Tractor Company in its plant at San Leandro, Calif., for assembling the chain links on which the treads of a Caterpillar tractor are mounted. One complete link, consisting of 2 side pieces, a bushing and a pin, are assembled at each stroke of the press. In operating, the links previously assembled are held by the hold-down *A*, which prevents them from moving due to the slight incline of the roller conveyor. A side piece is placed over the short stud at *B*, which also fixes the depth to which the bushing shall enter. Another side piece is placed on the right-hand side of the ram at *C* and a bushing is placed on the same pin as shown at *D*. The other end of the side piece remains loose on the gage pin *H*, which enters the bushing that was



Assembling links in the track used on Caterpillar tractors

assembled last, and centers the four side pieces for the bushing and pin assembly.

The pin shown at *E* is a press fit in both side pieces, but is loose in the bushing. As the ram comes forward the gage pin *H* enters the bushing *J*, the pin *E* enters the side piece *K*, and the two links and the bushing at the far end are pressed together. The hold-down *A* fixture is then released, the link is pried off the stud *B* and the operation is repeated. Small cross pins prevent the large pins from turning or falling out should they wear loose.

An interesting feature of the press is the use of a variable-speed pump by which the amount of oil pumped can be varied to suit.

A Home-Made Mandrel Press

By Paul Leo

Needing a mandrel press and not finding any on the market to suit me, I made the one shown in Fig. 1. It is constructed entirely of channels, no patterns or castings being required. Instead of making the screw and the nut, however, I bought a 6-ton geared screw-jack and removed the head. The exposed end of the screw was drilled $\frac{3}{8}$ in. in diameter and $\frac{5}{8}$ in. deep to take the attachments shown at *A*. The jack was attached, in inverted position, to a plate fastened to the under side of the press beam. A 1-in. pipe was screwed into a flange attached to the upper side of the plate, to inclose a spring for bringing the screw to its highest position when it was disengaged from the nut. The upper part of the spring was fastened to a cap on the end of the pipe. At *B* is shown the connection between the spring and the screw.

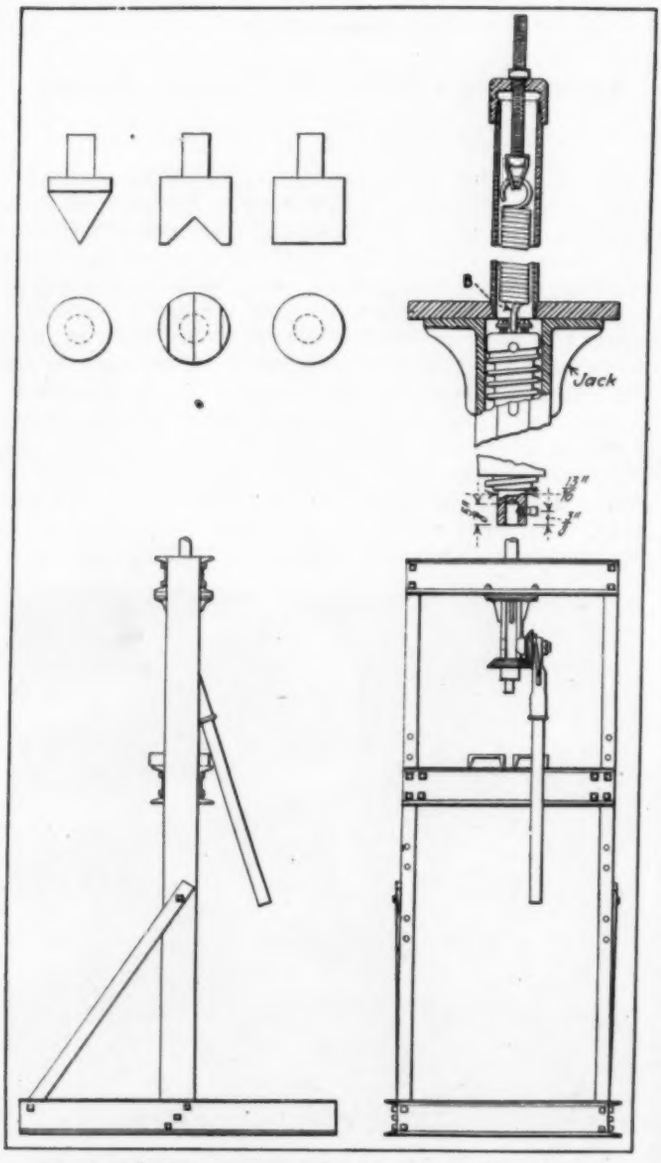


Fig. 1—Mandrel press constructed entirely from channels

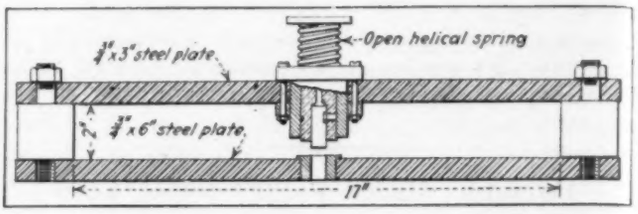


Fig. 2—Die set for use in mandrel press

The channels forming the table are attached to the uprights, leaving a clear space of 4 in. between them. Two short pieces of channel are laid on the table to form a rest for the work. The lever is normally held in the socket by a pin. By taking out the pin and removing the lever, the screw can be operated by means of the socket, thus providing for speed and sensitiveness of operation.

I soon found other uses for the press besides forcing mandrels in and out of work. Having to punch some holes in sheets, far from the edges, I made the die set shown in Fig. 2 and laid it on the table of the press. Owing to the fact that the bridge of the die set is not subject to stress, serving only to guide and steady the punch, its capacity exceeds that of a small punch press, without undue bulk. The die set can be used for many jobs of small die work on a low-production basis. It will be noted that the punch is entirely contained in the bridge, and is not connected to the screw in any way. Other attachments can be added to this press with equal facility, making it a valuable accessory.

Making Brass Disks—*Discussion*

By C. Kugler

Engineer, General Electric Company, Philadelphia

I read with interest the article on the above subject by H. M. Darling, on page 983, Vol. 70, of the *American Machinist*. I do not see why the last operation could not have been done in the turret lathe. Why not machine the bar to size, turn the radius on one side of the washer and then cut it off? After that I would face off the other side in the chuck jaws the same as Mr. Darling has done.

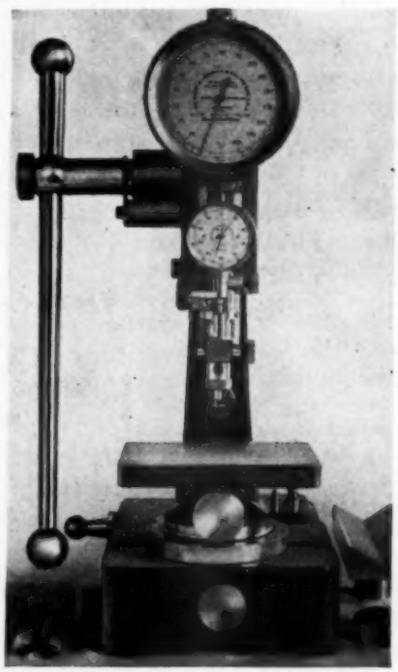
I do not see how the operator placed the disks against the supporting pad so that they would run true enough to clean up. When the number of pieces do not warrant the making of special tools I face off work of this nature as follows: I place a piece of wet paper between the face plate and the work, exert pressure against the work by means of the tailstock screw and a block. This will hold thin work sufficiently to take a light cut after the pressure is removed. Soldering the work to the faceplate is another method of holding. It is only necessary to tack the edges with a few drops of solder.

Methods of Hardness Testing

The Monotron

The Monotron is a static mechanical-pressure machine employing a small diamond-ball impresser point for measuring the hardness of metals, minerals, glass, porcelain, brick, wood, rubber, fiber, paper, and other materials.

Two dials are used to take the readings, the one measuring the pressure applied and the other the depth of impression under load. The pressure scale reads up to 160 kilograms, or 352 pounds, and the micrometer depth gage reads in 1/5,000 inch and also in 1/200 mm. The use of this combination of dials has been made practical in this instrument by means of a compensator device which serves to correct the depth-indication errors due to contraction of parts of the machine and the diamond itself when under strain, this compensation being particularly important with hard materials.



The Monotron Measuring Machine

The constant-diameter variable-pressure feature of the Monotron enables it to measure not only quantitative but also comparative hardness. Steels showing a hardness of 100 Scleroscope, or 113 kgs. on the Monotron scale, may be taken as the upper standard with which all comparisons are to be made. If, for example, the pressure reading is 11.3 kgs. on the Monotron scale, the material being tested is one-tenth as hard as a perfectly heat-treated and quenched high-carbon steel. Whether the material is elastic as rubber or as inelastic as soft brick, the same comparative figures may be quickly obtained. It is claimed that this enables the classification of all metals and materials in their proper position in the order that minerals appear in the Moh scale, but with greater accuracy.

The standard pressure scale for universal service is read in kilograms on a spherical impression having a diam. of 0.36 mm. made with a diamond ball point ¾ mm. in diam. Direct conversion to other scales is possible. For example, 50 hard Scleroscope, or 325 Brinell, becomes 45 C-D Scale, whereas 100 hard Scleroscope (713 Brinell) becomes 113 C-D scale. This is also an indication that the very hard materials can be accurately measured with the Monotron.

Special scales of any desired pressure capacity up to several hundred kgs. may be provided, as well as others of lower capacity. Special scales may be drawn up to read in terms of Scleroscope or Brinell values, which would have a sliding relation to the C-D increment line. In addition to these Scleroscope and Brinell values, unit-stress values may be indicated instead of pounds or kilograms. Thus unit stresses in tons per sq.in. may be obtained direct on all materials.

By means of the constant-pressure feature with variable penetration, which is also available, hardness readings reciprocal to the standard constant-depth values are obtainable, although with less accuracy on the harder metals. Therefore, the constant-pressure values are confined to the softer metals and materials and to measurements of the amount of flow which is often of great importance in the study of metals subjected to severe cold working as in embossing operations, extruding, deep drawing and bending. This opens up some very interesting possibilities in hardness testing.

While a ¾-mm. ball has been adopted as the universal standard, any other shaped point, or standard steel balls of larger size, may be used for special purposes such as, for example, a flat punch for measuring elastic limit values, or larger steel balls for accelerating measurements with the softer metals and other comparatively soft materials. While under this flexibility of application, the necessary adaptations to a wide variety of purposes is provided, users of these instruments do not necessarily depart from what may be accepted as a universal standard of hardness, for whatever values are thus obtained, they are always reducible to the unit-stress values called for in a Monotron hardness tester.

If Monotron depth of impression readings on a given specimen are plotted against pressure readings, the depth of hardness will be indicated. Thus, if a metal under test yields a straight line, it indicates that its hardness is of uniform depth. If the line bends upward, the sample probably has a decarbonized surface which is softer than the core. If the line bends downward, the specimen has a hard case of limited depth. The operation of this instrument is said to be simple and rapid.

Courtesy of The Shore Instrument & Manufacturing Company

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

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A Standard Machine-Tool Color

AFTER considerable more or less footless discussion in standardization committees and other gatherings, a standard machine-tool gray has emerged without much ado and has been adopted by the members of the National Machine Tool Builders' Association by an overwhelming majority. To those unbiased observers who saw the range of grays used by various builders as exhibited on panels at the Asheville meeting last spring, it will not be particularly surprising that an agreement on the one chosen was so easily reached. The range, after all, was not great.

It is planned to have all machines to be shown at Cleveland in the autumn painted, or otherwise finished, in the new standard color. The resulting uniformity and attractiveness of appearance should go far to convince even the reactionaries among the buyers of machine tools that this piece of standardization is well worth while.

*

A Census of Distribution

BY FAR the greatest task in its history confronts the Census Bureau next year. Not only must regular censuses be taken of population, manufactures, agriculture, and mining, but Congress has added an even greater task, a census of distribution. The advice of groups of thoughtful business men as to the material to be gathered and the subsequent tabulations to be made in these various censuses is a big step in the right direction —a step which was behind the elevation of the Bureau of Foreign and Domestic Commerce, under Secretary Hoover and Dr. Julius Klein, to a point of great influence in the business structure of the country.

Of special interest to the country's producers of raw and finished products is the Advisory Committee on Manufactures. Headed by Col. L. S. Horner, President of the Niles-Bement-Pond Company, New York City, as Chairman, it is composed of men who have long been students of the statistical needs of manufacturing interests throughout the country. It will be their task to help draw up the general and miscellaneous industrial schedules for the Census of Manufactures, which is to be taken next January, to encourage a reasonably quick response by the manufacturers, and to determine the tabulations which shall be made from the data gathered.

At its initial meeting, the Committee took the stand that, above all, the next Census of Manufactures should be such as to produce material of current potential practical value to manufacturers —the basic material upon which the manufacturers can determine their markets and anticipate probable trends of the future. If the producing concerns of the country are to be asked to spend time and money in arriving at the data requested from the Census Bureau, it is only fair that they shall in turn be given data which will be of some substantial value to them in the solution of their production and distribution problems. In taking this stand for practical production and marketing statistics, the Committee should have the hearty support of every manufacturer in the country.

*

Does College Shop Equipment Affect the Machine Industry?

JUST how far does college training affect machine equipment? Does contact with out-of-date machines in the college shop deter the purchase of new equipment in shops to which the college students go after graduation?

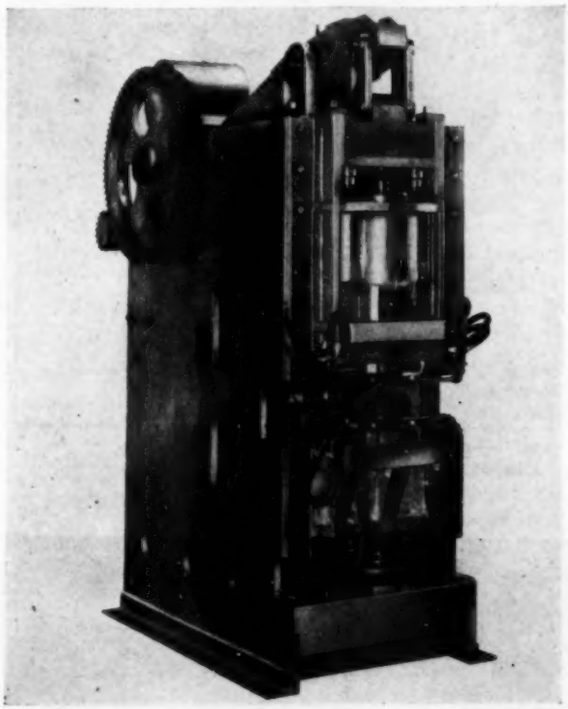
These are not new queries, but they come at this time from a British engineer who believes, as the result of his years of observation, that poor machine equipment in college shops is one reason that shops in his country do not demand the latest equipment to the same extent as in ours. The fact that the student becomes accustomed to old machines tends to blind him to the advantages and economies to be secured with modern equipment. The correspondent compares the equipment in engineering colleges with that found in medical institutions, and contends that no surgical college would think of retaining equipment as much out of date as is found in many mechanical schools in that country.

The point is well taken, for while a student can learn to drill, turn and bore on antiquated machinery he cannot grasp the value and advantages of modern equipment unless he has the opportunity to become familiar with it and see it in actual operation.

SHOP EQUIPMENT NEWS

Thomson Model 290 Heavy-Duty Power-Driven Vertical Welder

DESIGNED for the welding of a wide variety of work such as light fabricated joists and similar structural shapes, as well as for multiple projection welding on medium or heavy stampings and forgings, the model 290, power-driven, vertical welder has been announced by the Thomson Electric Welding Company, Lynn, Mass. The machine is also adaptable to butt welding various parts which can be handled best in a vertical position. Practically all of the frame parts of this welder with the exception of the lower slide, upper terminal block, and the upper slide are made of heavy plate and bar stock fabricated by electric arc welding, and the various units thus fabricated are either bolted or welded together. A 350-kva. transformer is supplied.



Thomson Model 290 Heavy-Duty Power-Driven Vertical Welder

The operation of the machine follows conventional methods of operating automatic spot welders, that is, the movement of the upper slide is obtained through a heavy rocking arm or lever actuated by a cam. The camshaft drive is obtained by a 4½-hp., four-speed motor having push-button control. A reduction gear is placed between the motor and the camshaft and the cam itself has a removable insert, which furnishes the final pressure on the weld. This insert can be varied in shape for different conditions.

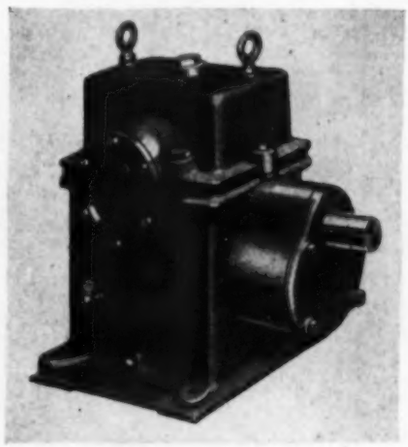
A dual pressure arrangement has been built into the machine, consisting of three springs, two light springs set in the upper slide head with a heavy spring between them. When operating, the machine is adjusted so that the light springs apply the pressure at the time the current is turned on and the heavy spring engages as the weld is finished and causes a heavy blow on the weld. The intensity of the blow is adjustable and the initial light pressure can also be varied through adjustment of the lighter springs. It is claimed that this dual pressure arrangement permits lower welding currents than is possible with one heavy spring. In other words, light pressure permits high resistance just at the start of the weld when it is required, and heavy finishing pressure which flattens the material and insures a good homogeneous weld.

The mounting of the springs directly over the work permits more sensitive pressure arrangement than ordinariiy obtained. The lower knee of the welder is adjustable vertically for die wear and work of different thicknesses. Standard camshaft speeds are 10, 15, 20 and 30 r.p.m. The approximate weigth of the machine is 10,000 pounds.

Foote Type HGX Worm Gear Speed Reducer

Constituting an addition to the "Hygrade" line, a type HGX worm gear speed reducer has been placed on the market by the Foote Bros. Gear & Machine Company, 215 North Curtis St., Chicago, Ill. This reducer is an intermediate step between the type HGS single-reduction unit and the type HGD double-reduction unit. The type HGS single-reduction unit with right-angle drive has a maximum ratio of 58 to 1, by which the maximum efficiency can be obtained. The HGD double-reduction reducer provides for all ratios over 58 to 1, and up to 5,000 to 1, but the shafts are parallel. The type HGX, being offered, provides higher reduction ratios than standard for the type HGS, but still has the right-angle drive.

The reducer consists of a standard "Hygrade" single-reduction worm reducer and a set of helical gears mounted on the worm shaft and inclosed in a suitable housing. The



Foote Type HGX "Hygrade" Worm Gear Speed Reducer

helical gears have a maximum ratio of four to one, thereby increasing the standard ratios of the HGS units by a maximum of four times. The standard ratios at the high-speed end are 1:1 to be used only for reversing the relative rotation of the worm and worm gears, 2:2, 3:1, and 4:1.

The maximum motor speed allowable is 4,000 r.p.m. The unit is fully inclosed and self-lubricated, and is provided with anti-friction bearings.

Losenhausenwerk Turning-Tool Pressure Measuring Device

A DEVICE for measuring and recording the pressure on turning and drilling tools has been introduced into the United States by Alfred Suter, 200 Fifth Ave., New York, N. Y., representative of the Losenhausenwerk Dusseldorfer Maschinenbau, A. G., Dusseldorf Grafenberg, Germany. The manufacturers claim for the device the automatic measuring and recording of created forces in machine-tool operation, flexibility in attachment to various types of work in machines, and ease of transfer from one machine to another. The device illustrated in Fig. 1 is used for measuring pressure on turning tools and may be attached to any lathe of height of center of over 7⅞ inches. The device determines the forces created at the tool end in lathe turning. A similar recording instrument attached to a drilling machine testing table is shown in Fig. 2. This device is used for measuring the pressure applied to drills on drilling machines and is available for any drilling machine of medium size. The turning-tool pressure measuring device is obtainable in sizes varying from a vertical pressure of 3,300 to 22,000 lb. per sq.in., while the drill-pressure measuring device is available in three sizes varying from 5,500 to 22,000 lb. per sq.in., in drill pressure.

The principles of the measuring chamber supports are illustrated in Fig. 3. Two of the forces resulting from the cutting operation, a vertical force V, and a horizontal force N acting perpendicular to the cutting plane, are those measured. The horizontal force N is resolved into one parallel with the axis of rotation and another one perpendicular to the axis of rotation. The force parallel to the axis of rotation becomes the axial pressure L and the force perpendicular to the axis of rotation becomes the radial pressure R in the direction of the tool shaft. These three components are perpendicular to each other and represent the leading forces for the machine and the tool.

The tool is clamped tightly in the toolholder resting in a horizontal plane upon a pendulum support and

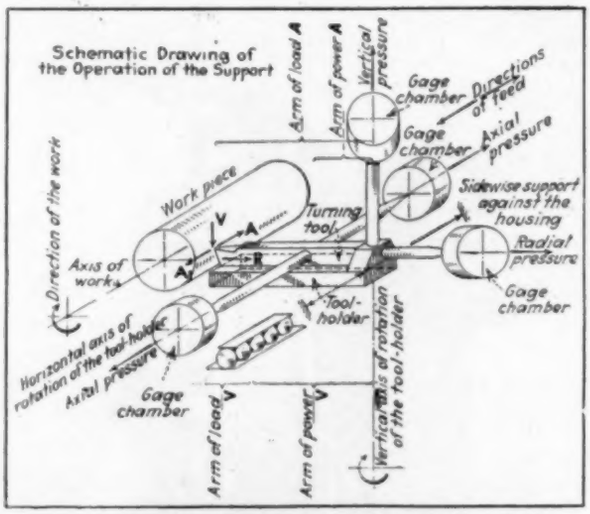
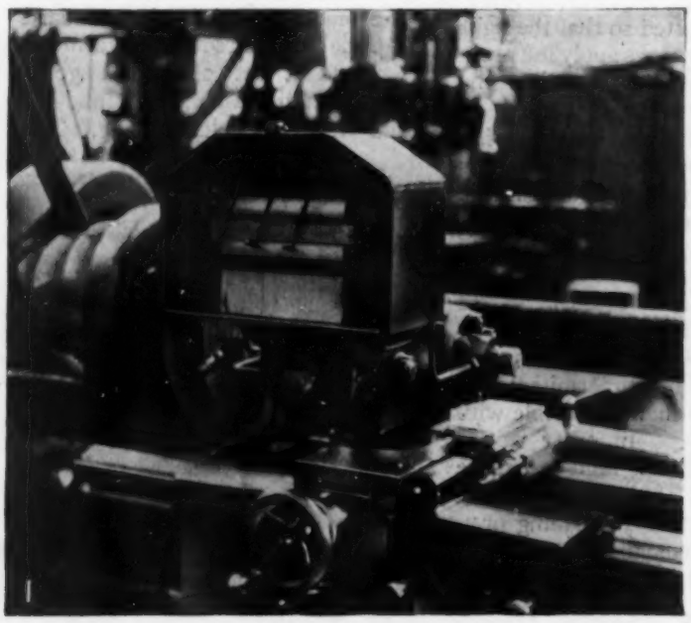


Fig. 3—Schematic diagram of the operation of the support in the Losenhausenwerk Turning-Tool Pressure Measuring Device



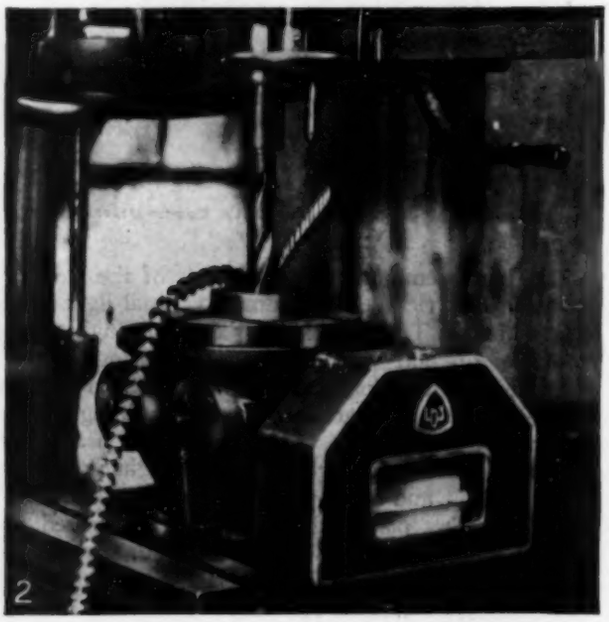


Fig. 1—Losenhausenwerk Turning-Tool Pressure Measuring Device set-up to measure pressure on a turning tool in a lathe.
Fig. 2—Set-up to measure pressure applied to drills on drilling machines

being supported sideways against the wall of the housing. The vertical pressure V is transferred at a suitable ratio to the vertical gage chamber situated in back of the recording instrument by means of a two-armed lever, the fulcrum of which is the pendulum support, while the radial pressure R is transferred directly upon the gage chamber situated behind the toolholder. In order to determine the axial pressure L, which may be acting in either of two opposite directions (depending on the direction of the feed) the toolholder is allowed to rotate about the vertical gage chamber in the plane of the supports. The pressures are transferred each by means of an adjustable strut pin, being situated at one side of the toolholder, to the gage chambers which are arranged on either side. Each one of the gage chambers is provided with a stop valve. If the apparatus is moved towards the spindle head, the valve provided on it must be closed. When moving in the opposite direction, both valves must be closed.

THE REGISTERING MECHANISM

All three pressure components are registered on a roll of paper by means of the "Threefold Recording Device." The unusual clockwork mechanism is utilized to move the paper at a uniform speed, electric relays being used to mark the times of the different operations being observed point-wise on the edge of the paper. The clockwork which moves the paper allows a regulation of the travelling speed of the paper within certain limits by means of a knurled screw. The movement of the paper can be stopped entirely by simply lifting the feed rolls.

Without complicated calculations, the qualitative and quantitative work of the tool can be obtained from the magnitude of the forces L, R, and V. The ratio between these forces due to different feeds or different cutting speeds can be easily read in the diagram. It is also possible to determine the duration of service or the economical properties of the tool from this course of forces. The determination of the most favorable cutting speed and feed for a particular material under consideration with a certain quality of tool steel may be made with this device.

Tests of manifold character can be made with this apparatus, one of them being the obtaining for a particular material the most favorable cutting angle in connection with a practical cutting speed without considering the feed, or at a pre-determined cutting width, the object being to make the tool edge last as long as possible, and the power consumption of the lathe remain relatively small.

Rockwell Inclosed-Front Heat-Treating and Carburizing Furnaces

IMPROVED working conditions for the operator, and better heating are features of this furnace which is adapted to a wide range of heat-treating operations such as annealing, hardening, normalizing, carburizing, and drawing. It has been placed on the market by the W. S. Rockwell Company, 50 Church St., New York, N. Y. The furnace may be operated on fuel or by means of electricity. Comfortable operation is maintained by inclosing the heating chamber opening and door in a manner that induces a current of air toward the furnace as shown in Fig. 2, instead of the usual discharge of hot gases toward the operator. The spent gases are discharged upward from the hearth level and utilized to preheat the air.

A hot hearth under the door opening is provided by extending the chamber under the hearth in line with the front wall. This increases the effective heating area of the chamber and offsets the cold zone that is usually formed when the door is opened. The heating chamber is materially wider and higher than the working opening to prevent overloading, and to avoid local heating, and thus provides uniform application of heat around the charge. A hearth of alloy metal, silicon carbide, or standard refractories is supplied and the floor bars or other supports are arranged to suit individual requirements. Spent gases from the fuel-fired furnaces are discharged from the floor level to insure uniform pressure on the stock in the chamber. In some cases, the vent is under the door, which is adjusted to the necessary height, the gases discharging upward. In others, a standard arrangement of flues and dampers is adapted to the chamber size and heat-treating process.

The furnace is also built with an uncovered opening for heat-treating light stock that may be handled on trays or exposed on supports above the chamber hearth. Discharge of spent gases through the working opening serves to protect the stock and maintain uniform heating conditions. The inclosed front protects the operator from the gases which are discharged upward.

Recuperators within the inclosed front or at other points of access, ac-

Fig. 1—Battery of Rockwell Carburizing Furnaces of the door type

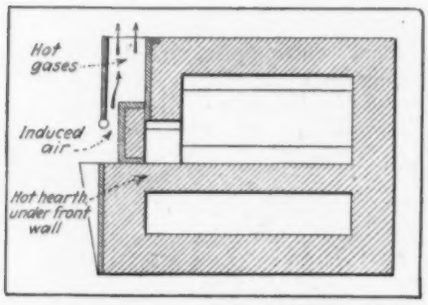


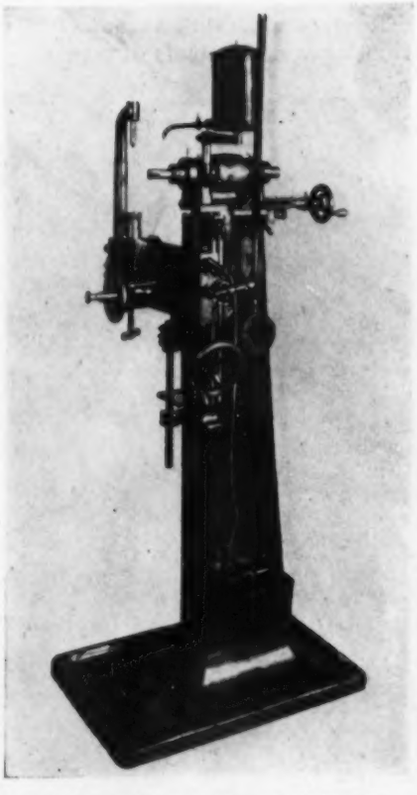
Fig. 2—Diagram showing the inclosed front for covered working opening, by which the operator is protected from heat

cording to the size of furnace, may be used to recover heat in spent gases, when the amount of heat discharged justifies the cost. Quenching tanks of rotary conveyor or stationary type may be installed to serve one or more furnaces operating continuously or intermittently.

This furnace is of sturdy design and is built with a double refractory lining made up mostly of standard firebrick shapes and insulating material. It is furnished in a portable type on legs or on a solid foundation. Both the under-fired and over-fired methods of heating are provided to suit temperature requirements and the nature of heat-treating process. Burners for oil or gas may be located on the front, rear, or sides, with provision for regulation from the front, at a point convenient to the operator. All the fuel and air entering the furnace is under control.

Deckel Universal Tool Milling Machine

ESPECIALLY adapted to milling punches and tools in one chucking, the Deckel universal tool milling machine manufactured by Frederick Deckel, Muenchen, Germany, has been placed on the market in the United States by the Index Machinery Corporation, 49 Central Ave., Cincinnati, Ohio. The work is in front of the operator at all times, and all handles and adjustments are centralized. The cutter head is adjustable and so is the dividing head. These movements make possible such operations as milling, drilling, boring and slotting without moving the piece from the chuck.



Deckel Precision Universal Miller for tools and punches

The working surface of the table is 18x6¼ in., the longitudinal table feed being 9½ in., and the vertical table feed, 8 in. The horizontal feed of the spindle head is 5 in. A knee is furnished to hold the dividing head in the horizontal position. The collets and chucks furnished with the machine can be used in both the working spindle and the dividing head, the collet capacity being ½ in. The diameter of the spindle hole is ⅝ in. Four speeds in either direction are available, the range being from 105 to 1,070 r.p.m. Power required equals ¾ hp. A tailstock for long and slender parts is provided.

Standard equipment includes a vertical table, a dividing head, three dividing plates, a knee for the dividing head, one three-jaw chuck, two collets, ⅜ and ½ in., one countershaft, and necessary wrenches. Extra equipment includes a universal vise with knee, a horizontal table, an extra three-jaw chuck, and drill chucks, extra collets, cutters, and arbors. A scriber attachment may be furnished for checking straight or circular lines or laying out the work to be milled. The machine weighs 790 pounds, approximately.

"Eda" Turret Punch

Holes in twelve sizes from ⅛ to ½ in. in diameter may be punched in machine steel up to 5/16 in. thick on the "Eda" turret punch announced by the Wiedermann Machine Company, 1817 Sedgley Ave., Philadelphia, Pa. Changing for different sizes of punch and die is not required as these parts are mounted on a turret. Different sizes of holes may be punched in a few seconds. The punches and dies are simple in design and are said to be inexpensive to replace. Special square and other shaped holes can be punched. Angle and T sections up to 1¾ in. can be accommodated as shown.

"Eda" Turret Punch

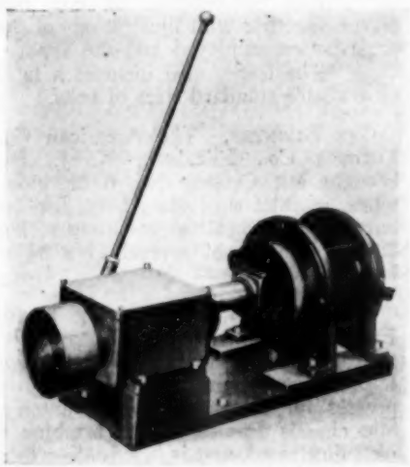
The Eda turret punch is capable of quick adjustment. An automatic ball stop catches the revolving turret as the punch and die are centralized under the ram. The machine weighs less than 100 pounds.

Garvin Timkenized Speedbox for the No. 1 Automatic Tapping Machine

To obtain greater production and range on the No. 1 automatic tapping machine, the Garvin Timkenized speedbox has been redesigned by the Western Machine Tool Works, Holland, Mich. The features may be listed as follows: Three selective speeds; Timken equipped throughout; chrome-nickel steel gears, heat-treated and hardened,

coarse pitch and rounded teeth, gears run in a bath of oil, constant power input, easy operation, single unit assembly adaptable to all machines in use, greater production, no belt shifting to change speeds, and increased work range of the machine driven. The unit may be obtained for direct-connected motor drive, as illustrated, or for single pulley drive.

The sliding cone gear has a long bearing on the shaft, thus preventing chattering and providing for easy shifting. The cone gear may be shifted easily and quickly from one speed to another. The lever is within easy reach of the operator. All moving parts within the box are lubricated by a bath of oil. With a 12-in. driven pulley the speeds are 300, 400, and 600 r.p.m., and with an 8-in. driven pulley they are 450,

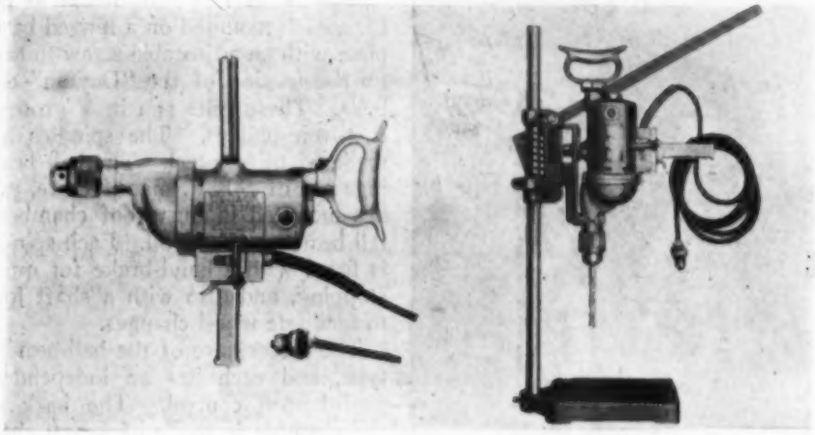


Garvin Timkenized Speedbox for the No. 1 Automatic Tapping Machine

600, and 900 r.p.m. The motor-driven type requires a 1-hp. motor running at 1,200 r.p.m. Both the motor-driven speedbox and the pulley-driven speedbox are mounted on sturdy cast-iron beds.

Wodack ⅝-Inch Electric Drill

Capacity to drill up to ⅝ in. in steel and up to 2 in. in wood is furnished in the drill shown. It has been placed on the market by the Wodack Electrical Tool Corporation, 4627 West Huron St., Chicago, Ill. The drill is powered with a G.E. motor which may be obtained for either d.c. or a.c. circuits of 60 cycles or less for 110 to



Wodack ⅝-inch Electric Drill

125 or 220-250 volts. An oversized double-pole trigger switch is placed in a convenient position. Timken roller bearings take the heavy thrust loads and ball bearings are used in other positions. Hardened gears constitute a feature and the grease compartments are designed to hold enough lubricant for long periods of operation without refilling. Ventilation is provided by means of an oversized fan for quick cooling during running.

As will be noted at the right in the above illustration, the tool can be held vertically in a quick-acting slide actuated by a hand lever. The mechanism can be raised or lowered on the column.

Rickert-Shafer Semi-Automatic Tapping Machine

A FRICTION-DRIVEN, geared, semi-automatic tapping machine has been placed on the market by the Rickert-Schafer Company, Erie, Pa. This machine can be furnished with single or multiple spindles in belt or motor-driven types. It is capable of tapping 1-in. holes, 8 U.S.S. threads per inch, without overloading.

A multiple-disk friction clutch is used for driving the spindles, thus minimizing tap breakage. A block, located on the serrated cam on the left side of the spindle housing, acts as a trip for the tap, and can be set at any predetermined depth, when the machine is being used for automatic production. A downward pull on the handle engages the clutch, so that the spindle is driven into the work. When the tap has reached the required depth, the trip mechanism shown in Fig. 2 comes into action, releasing the clutch in one direction, and throwing it into the reverse direction immediately. This action sets in motion a train of gears which reverses the spindle, and the tap is backed out of the work. A slight upward thrust on the handle again reverses the mechanism, and the machine is ready for the next piece.

This machine is furnished with a pump that delivers an ample supply of coolant to the tap at the time of

Fig. 1—Rickert-Shafer Two-Spindle Semi-Automatic Tapping Machine

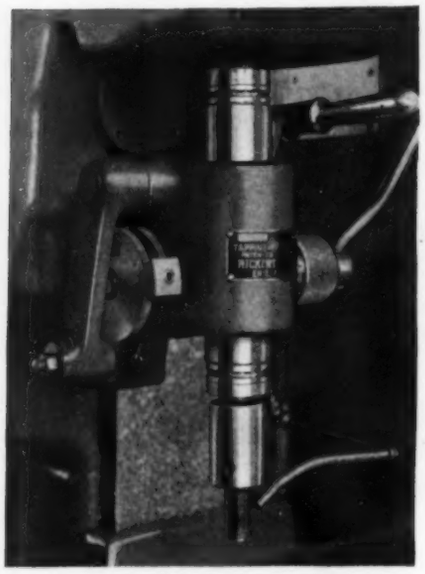


Fig. 2—Close-up view of the spindle operating mechanism

cutting. The overflow is returned to the reservoir in the base. On ordinary production tapping, one operator can keep two spindles going full time.

Standard "Right Speed" Two-Motor Buffer and Polisher

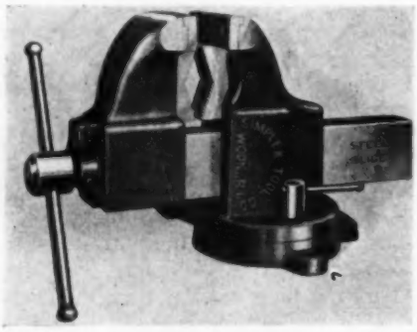
The two-motor buffer and polisher manufactured by the Standard Electrical Tool Company, 1938 West 8th St., Cincinnati, Ohio, is made in 3-, 5-, and 7½-hp. sizes. Any speed from 2,000 to 3,000 r.p.m. can be obtained by changing either pulley.

The buffer has two motors in the base, each mounted on a hinged baseplate with an adjustable screw to take up the tension of the "Dayton" cog belts. These belts run in V-grooved cast-iron pulleys. The spindles are made of nickel-steel. The ball bearings are of S.K.F. manufacture, and are mounted in dustproof chambers. All bearings run in oil. Each spindle is fitted with a hand-brake for quick stopping, and also with a shaft lock to facilitate wheel changes.

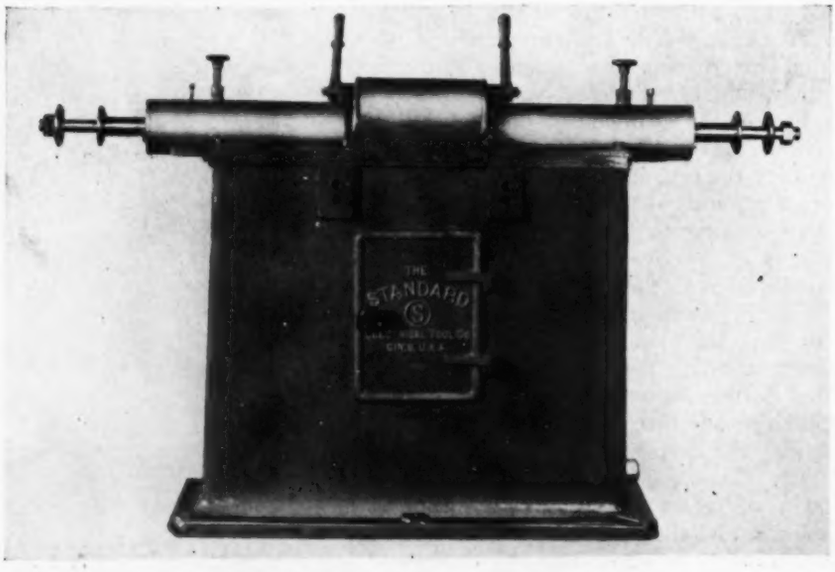
The motors are of the ball-bearing type, and each has an independent push-button control. The back of the machine is made of heavy sheet metal and is hinged to the base.

"Simplex" Pipe Vise

A combination pipe vise having a steel slide has been placed on the market by the Simplex Tool Company, Woonsocket, R. I. This steel slide feature has been carried over from the "Simplex Machinists'" and "Coachmakers'" vises, and eliminates the possibility of breakage in the slide just back of the front jaw, where practically all vise breakage occurs. The pipe jaws are made of hardened tool steel, and are reversible. The inserts are made of hardened steel held in place by screws and are doweled to prevent loosening or shifting in service.



"Simplex" Pipe Vise



Standard "Right Speed" Two-Motor Buffer and Polisher

TRADE PUBLICATIONS

Cog Belt Drives. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has published leaflet 20,392 entitled "Cog Belt Drives for Industrial Service," giving uses, advantages, and construction of cog belt drives, together with illustrations of the construction employed and the applications. The leaflet also includes a table of available standard sizes of belts.

Gas Burners. The American Gas Furnace Co., Elizabeth, N. J., has brought out Catalog No. 6 on blowpipes, machlet tips, glass fires, fish-tail burners, and heating machines. The bulletin consists of several 11 x 8½-in. looseleaf sheets.

Riveters and Presses. The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has published catalog R-210 covering pneumatic riveters and presses for the fabrication of automobile chassis frames. Each machine is well illustrated, and is briefly described. The catalog contains 23, 11 x 8½-in. pages.

American Standards Year Book—1929. The American Standards Association, 29 West 39th St., New York, N. Y., has published the "American Standards Year Book—1929," giving a review of the national industrial standardization movement during the past twelve months, covering mechanical, electrical, building, transportation, mining, textile, and many other industries. The year book contains 88, 7½ x 7¾-in. pages.

Oxwelding Aluminum. The Linde Air Products Co., 30 East 42nd St., New York, N. Y., has published "Oxwelding Aluminum and Its Alloys," which describes in detail oxwelding processes as applied to aluminum in all its forms. It includes complete instructions for arc welding both cast and sheet aluminum and also the strong aluminum alloys. The booklet contains eight 10½ x 7¾-in. pages.

NEWS
OF THE WEEK

British Industrial Conditions Improve and Exports of Machinery Increase

Low Selling Prices Hold Profit Margins Low

By Our London Correspondent

DURING the vacation period only ordinary industrial developments are occurring. The Federation of British Industries states that trade and employment were well maintained during the second quarter of the year and adds that, "for the first time for many years the seasonal slowing-up of the early summer months has been moderate. There has, however, been no appreciable change in the general outlook." The prospects of dearer money, limitation of financial facilities, price unsettlement and industrial unrest are the clouds on the horizon.

Industries in general are complaining that prevailing selling prices leave small margins for profits. Makers of electric transformers and control equipment continue to report good business, but orders for heavy electric machinery and industrial motors seem scarcer. Structural engineers and firms engaged in the manufacture of heavy machinery appear to be fairly well booked with orders, but railroad passenger-coach and freight-car builders are slack.

While in the leading machine tool shops very little change can be reported, no decline is noticeable. Markets remain about as they were, and the complaint that railway companies are not placing orders is still heard. A fair number of orders has been placed by the government, however, largely in connection with arsenal work and mainly for heavy tools. In shipbuilding an attempt will be made in due course to secure the so-called "blue-ribbon of the Atlantic," but no details are yet available, though the plans for vessels already on the ways, it is understood, are being modified in the light of recent experience.

The motor-car industry, or at least some of its spokesmen, became perturbed recently over the prospect of the removal of duties levied on imported automobiles and accessories. The government announces that as soon as possible the duties will be removed. Some of the automotive companies are improving their methods and equipment to meet the competition that may be expected when the new Ford factory to the east of the London area is completed and running. A few amalgamations have been effected recently in the industry, and now a new scheme, as yet only in the air, has been proposed to merge a half dozen of the relatively small companies, with a capital of about two million pounds, to specialize on 10-hp. cars for the home market and 20-hp. cars for home and export trade. One of the firms approached has withdrawn definitely from the negotiations, but London interests have investigated the financial positions of the firms concerned and proposals have passed between the parties. Announcement has also been made that the entire business and assets of one of the small-car firms, not without its commercial vicissitudes, have been purchased by a leading machine tool firm. Pleasure-car manufacturers have reached the slack season but builders of commercial lorries, omnibuses and passenger coaches report continued activity.

The report on British trade for the first half of the current year is not quite so favorable as had been estimated. Nevertheless, an increase of about three and one-half million pounds in the value of exports of British produce and manufacture is recorded, as compared with the similar period a year ago. Imports of electrical apparatus and appliances have increased and so also have exports, but not to the same extent. Exports of machinery are lower, textile machinery exports occupying the first place in this section, followed by electrical machinery. Both exports and imports of machine tools show an increase. Apparently, Great Britain to some extent has regained the machine tool market on the continent of Europe. At any rate Europe took more than one-third of the total export value in this line, while the principal British dominions took a little less than one-third and were not so satisfactory a market as compared with the same period of 1928. Low selling prices, particularly on the continent, continue to be unsatisfactory.

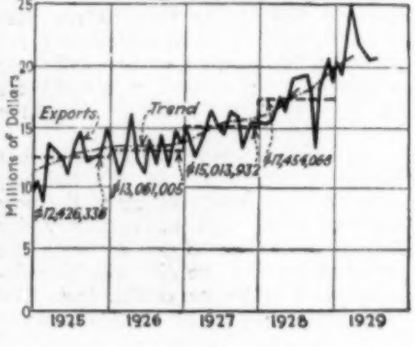
The railway companies must meet demands for the removal of the reduction of 2½ per cent in wages, salaries and fees which was made about a year ago. As shown by the latest half-yearly returns, the financial position of the railways has improved. However, this improvement is due to economies, including the 2½ per cent reduction just mentioned, rather than to increases in revenue. A better financial position was hardly expected. Traffic returns show declines in some cases, increases in others. Parallel with some increase in the volume of freight moved, and certain increases in the number of passengers carried, there has been a substantial decline in passenger revenue on account of lower fares. Co-operation in development of traffic over highways and railroads is to be brought about through the acquisition of shares in certain motor-transport undertakings by the two main railways.

* * * *

American Industrial Machinery Exports Show Continued Increases in June

EXPORTS of American industrial machinery continue to expand, continuing the trend of the past six years, according to L. J. Cochrane, Industrial Machinery Division, U. S. Department of Commerce. The volume of exports for the first half of 1929 was nearly $130,000,000, as compared with $102,000,000 for the corresponding period of 1928. Moreover, the business during the first six months of the year approximately equals the volume for the entire year of 1924, and considerably exceeds the volume for either 1922 or 1923. These export shipments are approaching a level of about $1,000,000 per working day, a trade of importance when measured in terms of monetary value, but of greater significance when the effect in European industrial production of these machines is considered. The recovery from the serious condition in which the industry found itself during the post-war slump is, according to Mr. Cochrane, obviously most gratifying to all

EXPORTS OF INDUSTRIAL MACHINERY
BY MONTHS



concerned, and the fact that the exports for the first half of the year show an increase of more than 27 per cent over those of the corresponding period of one year ago, suggests that the tendency toward further expansion is vigorous.

* * *

Most Automotive Exports Taken by South America

Two developments in automotive export trade—the marked shift in the export markets for passenger automobiles from European to Central and South American countries, and the rapidly growing sales of trucks and buses—are of great interest to the American automobile manufacturer because of the record of exports during the first six months of this year as compared with exports in the corresponding period of last year. A net loss of $5,456,532 in the exports of passenger cars to Europe was offset by a net increase of $9,320,795 in the exports to Central and South America. The total exports of trucks and buses during the first six months of this year were $20,277,896 greater in aggregate value than those in the first half of 1928.

Exports of automobiles, parts, and accessories reached an aggregate value of $339,159,664 during the first half of the year as compared to a value of $248,658,717 in the first half of 1928. The exports of passenger cars and chassis totaled 219,610 valued at $151,398,630, as compared with 194,354, valued at $140,260,508 a year ago. Shipments of passenger cars to Europe declined to 63,280 valued at $46,012,284, from 67,156 valued at $51,468,816, while exports to Central and South American countries increased in number to 61,467 from 44,185 and in value to $39,945,128 from $30,624,333. Exports of trucks, buses and chassis were 75 per cent larger in number and 50 per cent greater in value during the first half of 1929 than they were in the corresponding period of 1928. Shipments numbered 102,782, having a value of $61,142,784 as compared with 58,948 valued at $40,864,888, during the first half of 1928.

* * *

Navy Cruiser Curtailment Stops Machine-Tool Buying

By R. E. Saunders

After having secured an appropriation of $1,500,000 for the purchase of machine tools to be used in the new cruiser program, naval officials are reported to be uncertain as to whether or not they should proceed to spend these funds in view of the orders that have been issued suspending construction. It is generally believed, however, that whatever curtailment in the building program may be agreed upon, the new machine tools will be necessary for regular work at naval gun stations. The naval authorities are also awaiting developments in the new cutting tools. The situation is likened by some officials to that caused by the introduction of high-speed steel in 1905.

Further difficulties are faced by the Navy Department in the buying of machine tools due to the burdens imposed by the government's method of preparing specifications. Although accounting practices may be simplified by this method, it is protested that sight is lost of the fundamental point of preparing the specifications according to the use to which the article is to be put.

* * *

Aeronautics Trade Division Set up by Commerce Bureau

An Aeronautics Trade Division has recently been set up in the Bureau of Foreign and Domestic Commerce in response to the growing demand for current facts regarding aeronautic development and the expanding markets for American aircraft, parts, accessories, and allied products. This division supersedes the Aeronautics Section of the Transportation Division. In addition to its information and foreign trade promotion service, the work of the new division will include determining the most effective trade methods in building up markets and avoiding distribution wastes.

Canadian Standards Group Reports Continued Growth

The Canadian Engineering Standards Association, in its third yearbook, announces that it is "pleased to report again a continued growth in the work of standardization in Canada," and that "the relations between the association and the Canadian industrial interests are most cordial, and there is every evidence that the work being done by the association has been of practical service in many industrial problems." The association was established during the latter part of the World War, with the main object of promoting the establishment of industrial standards by providing an organization to receive requests for standardization, investigate their desirability, and arrange for the formation of committees, comprising both manufacturers and users, to determine standards.

* * *

The railroads on July 1 had 39,638 freight cars on order, the largest number on any similar date in the past five years, the Car Service Division of the American Railway Association announced. This was an increase of 16,359 cars above July, 1927.

* * * *

Prospects Bright in Metal-Working Industry for Third Quarter of 1929

By Robert M. Davis

Statistical Editor, McGraw-Hill Publishing Company

THE volume of current business in the metal-working industry of the country as a whole is on a materially higher plane than at this time last year, according to opinions expressed by members of The Council on the Trend of Business, composed of 5,600 leading executives in all lines of business, of whom about 975 are directly interested in the manufacturing and distribution of ferrous and non-ferrous metal. These business men indicate that the volume of business, based on inquiries by buyers, unfilled orders, sales and collections in the automobile industry at the opening of August, was about 8 per cent above that of this time last year and in other metal-working companies about 6 per cent above that of last year.

Near future business is particularly bright in the metal-working industry, the members of the Council expressing the opinion that the average volume of business during the next 90 days in the manufacturing and distribution of automobiles, automobile parts, and equipment will exceed the current volume by about 3 per cent, and will exceed the volume witnessed during the same 90-day period last year by 5 per cent. Members of the Council interested in the operations of other metal-working companies expect the average volume of business during the next 90 days will exceed the current volume by about 2 per cent, and will exceed the volume witnessed during the same 90-day period last year by 5 per cent. If these expectations are realized, the metal-working industry in the country as a whole will witness a very profitable summer and early fall season.

Economic trends in the agricultural industry have assumed the leading position during the past month as the most favorable factor underlying American business, in the opinion of the members of the Council. This rather sudden rise in influence on the part of agriculture is a result of a combination of causes, including: good crop prospects throughout the country except in the Northwest Central States, which section has been without sufficient rain cutting materially into the wheat crop prospects; the advance in prices of farm products generally during the past month, and the passage of "The Agricultural Marketing Act," with the subsequent appointment of a Board eminently satisfactory to agricultural interests and inspiring the confidence of business men as a whole.

It is the belief of the Council that back of this improved agricultural sentiment lies the personality of President Hoover with his demonstrated understanding of business, industrial, and agricultural conditions, coupled with his apparent ability to solve the problems through direct attack. His intelligent handling of foreign and domestic prob-

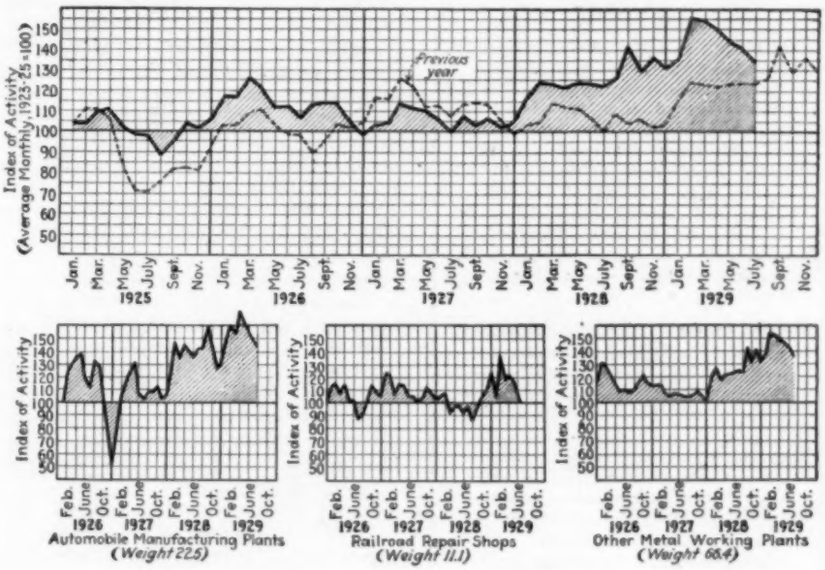
iems has apparently won for him the complete confidence of the general public and the general feeling that the President will be able to meet successfully adverse conditions as they arise. Never has confidence in the future been more prevalent in all branches of business and industry.

The tariff is still the most uncertain element in general business, and will remain so until both houses of Congress have passed the final bill. Members of the Council feel that many lines of business will preserve an ultra-conservative position until something definite comes out of Congress in the way of a tariff bill. Manufacturers are waiting to see what the new tariff holds in store.

* * * *

Activity in Metal-Working Industries Drops Off Materially in July

A DECLINE in activity of more than normal seasonal proportions was reported by the metal-working industry during July. Preliminary reports on electrical energy consumption indicate that the rate of activity in these plants during July in the country as a whole was 5.4 per cent under June, but was still on a plane 5.1 per cent over that reported for July last year. This drop during July, in the metal-working plants, however, is less than for all industry which reported a drop of 8.6 per cent during July. The metal-working plants as a whole appear to have reached their peak of activity this year in February, and the July activity was about 17 per cent under that witnessed during June. Last year the difference between the February and July activity was only 5.4 per cent.



The preliminary data indicates that the automobile plants, including the manufacture of parts and accessories, witnessed a rate of activity during July about 5.8 per cent under that of June, but were still operating on a plane about 1 per cent above July last year. This is the first month since January, 1927, that the rate of activity for any month has approximated that of the same month in the preceding year, every month since that date being materially above the same month of last year.

In the other ferrous and non-ferrous metal-working plants, the July rate of activity was about 5 per cent under June, but was still about 8 per cent above July of last year. These plants witnessed the peak of activity in February, since which month the trend in rate of monthly activity has been steadily downward. The July activity was 11.4 per cent under that of February, while the difference between the same months last year was only about 1 per cent. Operations in the railroad repair shops decreased by about 6.2 per cent during July as compared with June, and the July activity was just slightly below that reported for July last year.

* * *

Cost of Factory Buildings Lowest in Seven Years

Although industrial building has been at high levels this year, the cost of a new factory structure is 6 per cent below the average for the last 10 years, according to a survey of building costs throughout the country just made by the Austin Co., engineers and builders.

The cost of industrial construction is now 40 per cent under the peak reached in 1920, and it is at the lowest point since late in 1922. The computation is based on a standard building 100 x 200 ft. and includes material and labor.

Unemployment Committee Announced by Lamont

In accordance with a resolution, adopted at a recent meeting of the advisory committee for the Unemployment Census, that a small executive committee be appointed to co-operate with the Department of Commerce in making plans, Secretary of Commerce Lamont has extended invitations to the following persons to become members of the recommended committee: Dr. J. H. Willetts, University of Pennslyvania; William Green, president, American Federation of Labor; J. C. Bowen, Chief Statistician, Bureau of Labor Statistics; Wm. A. Berridge, Metropolitan Life Insurance Co.; Geo. E. Roberts, vice-president, National City Bank of New York; L. W. Wallace, American Federated Engineering Societies, and Dr. E. Dana Durand, Statistical Research Division, Bureau of Foreign and Domestic Commerce.

* * *

Number of Labor Disputes Less in 1928

The number of labor disputes was materially less in 1928 than the number of disputes for any other year since 1916, according to a recent report of the Bureau of Labor Statistics. The major causes of disputes were reported as wages, hours, and union recognition, these three causes accounting for 69 per cent of all disputes. Index numbers for the past three years, on a basis of 100 for the year 1916, were as follows: 1926—27, 1927—19, 1928—17. Of the 656 disputes ending in 1928, 272, or 41 per cent, were settled in favor of the employer; 197, or 30 per cent, in favor of workers, and 160, or 24 per cent, were compromised. Arbitration was used to settle 130, or 20 per cent, of the strikes.

* * *

R. M. Davis Appointed On 1930 Census Committee

Robert M. Davis, statistical editor, McGraw-Hill Publishing Co., has been appointed a member of the Advisory Committee which is planning for the 1930 census of manufactures. The committee will discuss the scope of the manufactures-census schedules, the determination of the line of distinction between the census of manufactures and the new census of distribution, and other problems which may arise. Manufacturing activities will be classified into 340 separate industries, according to Bureau officials, and the census will be taken on that basis.

Col. L. S. Horner, president of the Niles-Bement-Pond Co., New York, has been appointed chairman of the committee of 25 industrial executives and economists. Col. Horner is in favor of the obtaining of more data of current application.

BUSINESS BAROMETER

American consciousness of the share of the individual in the life of the nation is responsible for present optimism

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

TO PHILOSOPHIZE with regard to present business conditions in the United States is futile. They are without precedent in this or any other country. Principally, they are due to the American exaltation of the economic ideal and the ambition to attain it which pervades 120,000,000 people who speak a common language, and most of whom can read and write. It is true that China, East India and Russia are more populous than the United States, but their inhabitants are not linked together socially as are ours.

Americans have reached a point where the most isolated farmer on the western prairies is able to get the news of the world from hour to hour over his radio, and acquire a consciousness of his share in the pulsating life of the nation. This consciousness is largely responsible for the present ascendancy of the psychological factor in business. If the enthusiasm that it has created does not disturb seriously the relation between supply and demand, there is no reason why our prosperity should not continue indefinitely. But "indefinite" and "perfect" describe the unattainable, and last week's developments indicated that perhaps we may be approaching a period when the demand for money will be so much in excess of the supply that business will be compelled to slow down at least until our maturing crops are harvested and converted into money.

This is a possibility that has been pointed out by many bankers, and it has been forcibly impressed upon the speculative public by the unexpected advance of the New York Federal Reserve Bank's rediscount rate to 6 per cent last Thursday. This advance is official recognition of existing rates rather than a step upward to a new level, but it demolishes the hope of cheaper money to which many had been clinging upon the theory that the Reserve System would reduce its cost as a concession to the farmer. Therefore the advance has dashed the aspirations of the stock market "bulls" and the revelation that the Reserve authorities are still "agin" them is likely to restrain their enthusiasm for some time.

The difficulty of building pyramids to the sky was demonstrated early in the week when there was a severe break in public utility stocks as a result of the sensational decline reported in the shares of some of the Insull corporations whose securities are traded in Chicago and on the New York Curb Market. This decline was not surprising when the rapidity of the previous advance is considered, but its effect upon sentiment was greater as the depression and apprehension that it caused more than offset the elation due to the earlier rise. Except for this apprehension and for the high money rates which give good cause for it, the business outlook in this country would be almost fleckless. But it is idle to disregard a flaw so serious and to assume that it does not matter because it has thus far failed to affect business much.

The money market continues to range at from 7 to 12 per cent for call loans and 9 per cent for time money on the Stock Exchange. On July 31, the members of the New York Stock Exchange were borrowing $7,473,000,000 against securities, and it is estimated that bankers and brokers who are not members of the Stock Exchange were borrowing at least $3,000,000,000 additional. This is a total of approximately $11,000,000,000, and it seems absurd to say that borrowers will continue to pay rates that are so unusual for such a huge sum.

Just how and when a liquidation will be effected is a question by which many financiers admit they are nonplussed. Until it is answered by the event, it will continue to perplex the business world and cause uneasiness. And now that the Reserve authorities have suited the deed to some of their recent words, perhaps the answer is nearer than has been believed recently.

If private reports and available statistics are to be relied upon, there is no let up in domestic trade. Car loadings have been the heaviest on record for this season of the year, and the mail order houses announce a phenomenal gain in sales. A further increase of orders is reported in the steel industry, and the demand for copper continues active. The statistics of automobile production and sales are not quite up to expectations, except in the case of Ford, but they are far beyond what would have been thought possible a year ago.

Our exports of cotton and grain are smaller perhaps than have been anticipated, but it will be probably two or three months before Europe makes up its mind to buy heavily at current prices. Meantime, a hand-to-mouth business is to be expected.

Hypothetical questions continue to occupy the minds of foreign statesmen. Most of the national legislatures are adjourned and no fresh issue of importance is likely to be raised until they reconvene. The British opposition to the Young Plan is regarded as a political gesture, and it not taken seriously.

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From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

OPTIMISM is the prevailing note throughout the country in the machinery business. Inquiries and orders are maintaining their volume, and, in many cases, are improving, but deliveries promised are not better than from 6 weeks to 5 months after placing of an order, boring mills being promised now for February delivery. August is expected to be an unusually good month, opening a record-breaking fall season.

NEW YORK machinery business is "spotty," with some dealers reporting a big month and others reporting a lull. General Electric is buying steadily, but other buying is general and mainly for small items. Cincinnati reports a cheerful outlook, with no lull in sales. New England aeronautic concerns are maintaining the machinery demand, and turret lathes, radial drills, grinders, shapers, and planers figure prominently in orders placed. One order for drop-forging hammers totaled $60,000. Milwaukee activity continues brisk, with no changes of importance. Philadelphia reports a July business greater than that of June, with encouraging prospects for the remainder of the fall.

CHICAGO business shows a slight recession in July, with August looking considerably better. International Harvester is the leading inquirer. Buffalo reports a July of exceptional activity, with the New York Central electrification between Buffalo and Harmon encouraging Buffalo dealers. Detroit automobile concerns are still out of the market, but rumors of many changes in design presage a new demand in the fall.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

MILWAUKEE

Brisk activity continues to be manifest in the machine-tool trade. Deliveries on all metal-working equipment have not shown any improvement, and both dealers and manufacturers are hopeful that conditions will favor shortening the delays even though such conditions are dependent upon a temporary falling off in orders.

Demand at this time is about equally divided between large and small plants. The small shops have been profiting to an unusual degree through the subletting of orders from the larger industries. The automotive industry is asking the usual amount of equipment at this season. Motor truck manufacturers are still busy and tractor production is increasing through the expansion of production facilities as well as through an improved agricultural situation.

Demand for many lines of equipment that usually shows a falling off at this time of the year has not slowed up because of export demand, a lengthening of the construction season, and expansion in many industries. Concrete handling and paving machinery are apt examples of this tendency. The woodworking lines continue to show some slight improvement, but credit continues unsatisfactory in that field because of the prolonged inactivity. Tool and die shops continue unusually busy.

CHICAGO

Business for July this year, ordinarily a month of slackened activity in the machinery trade, shows but slight recession from preceding months. Those reporting a decrease say it will not run beyond 10 per cent, a falling off accepted as seasonal. From reports received, there seems to be every reason to believe that a lower level will not be reached this year, production activities in specialized industries of an unusually active character being indicated. Farm implement and tractor builders have started issuing lists for equipment that will run into big figures, the International Harvester Co. leading in inquiries. The electrical industry, notably the Western Electric Co. is said to be making preparations for expansion which will necessitate big additions to shop equipment, and industrialists generally are looking to a fall production much in excess of last year. Railroad buying is negligible, present inquiries being chiefly limited to single tools. Taken by and large, the outlook for an excellent business in machine tools following the vacation season is declared to be distinctly optimistic, the only drawback being unsatisfactory deliveries, which show small sign of improvement.

BUFFALO

July proved to be an exceptionally good summer month in the machine-tool trade of Buffalo. Activity was not quite so pronounced in the electrical field, but it was still good enough so that it was an exceptional month. Machinery and electrical equipment houses are expecting a big fall business. Some believe that the activity of the spring months will be duplicated during the last four months of the year.

Unofficial, but well-authenticated, reports indicate Buffalo steel industries prospered more than usual during the first half of the year. It is natural, therefore, to assume that there will be some expansion of facilities during the last half of the year to keep costs down and production up.

Electrical equipment people view with interest the merger of electrical interests under the head of the Niagara Hudson Power Corporation, which will be the largest producer of electrical output in the world. While this may not be of immediate importance in the equipment field, there are persistent reports of expansion of electrical energy production facilities that may be made necessary in the near future by the electrification of the New York Central between Harmon and Buffalo, as well as the electrification of other railroads.

NEW ENGLAND

Several fine orders for machine tools have been received in New England recently, especially from the aeronautical field. An upward trend in inquiries as well as in orders indicates an exceptionally busy last quarter of the year. Such equipment as turret lathes, radial drills, shapers, planers, and heavy-duty grinding units has been prominent among early August orders. Delivery of this type of machinery is in most cases well extended.

Billings & Spencer, Hartford, has received an order from Soviet Russia for 8 electric drop-forging hammers, representing a valuation of $60,000, for delivery to Moscow, Russia. Business from this source is particularly promising. Other factories under construction at Leningrad and elsewhere are expected to place orders for similar equipment. The Spicer Manufacturing Co., Toledo, is being shipped three of these hammers. The Moth Aircraft Corporation, Lowell, Mass., has received an order for 66 commercial Moth planes, valuation over $300,000, for delivery by January 1. The Union Twist Drill Co., Athol, has work underway for a 2-story addition, 60x105 feet.

PHILADELPHIA

Business transacted by machinery and machine-tool dealers in Philadelphia was greater in July than in June, and indications are that August will compare favorably with the previous month. Most of the dealers and producers here hold a hopeful outlook for the immediate future of the industry, and look for an early beginning of fall business.

No large orders were reported during the last fortnight. Industrial machinery moved quite well, with some orders from Eastern industries. The sales included lathes, air compressors, milling machines, and shapers. The automotive industry displayed some activity with the Philadelphia market somewhat favored for tools for replacements.

There were some sales of used machinery, and plants engaged in repairing reported a fairly active period. Altogether the industry continues to be on a satisfactory and a substantial basis, with prospects for continued activity. Inquiries have been fair, and apparently are indicative of early purchases.

CINCINNATI

Reports of machine-tool manufacturers of the Cincinnati district as to the business of the past week were very cheerful. The great majority stated that sales continued at their former good level, and in no case was it said that there was a falling off of any consequence. Those who had expected a midsummer lull have been most agreeably disappointed up to the present time. Two manufacturers of large tools, who report by the month instead of by the week, stated that the demand in the first half of the month indicates a gain in August.

Selling agents report that business held up well during the past week, showing a gain over the same period of last year, that a good volume of business is developing in local and adjacent territory, and that an active market seems probable in the early fall.

The sale of single tools and replacements to general machinists and miscellaneous users was the sustaining feature of the week's market, but there were scattering sales to railroads and concerns in the automobile industry. Inquiries flowed in freely from all sections of the country and for all varieties of tools. The number and nature of these are taken as a clear indication that a lively market is developing, and increased activity is expected in the early fall.

DETROIT

With the automobile industry in the midst of a quiet period, the machinery trade has slowed down considerably. Except for a general replacement business, dealers are receiving little or nothing from the automobile manufacturers, and during the past week or ten days there have been few significant inquiries. The general belief prevails that the automobile industry will be productive of a great deal of new business within the immediate future. While this has not been reflected in any tangible manner as yet, there is some evidence that a great many changes are being contemplated in motor design.

Outside of the automobile industry, a number of fairly substantial orders have been placed for machinery and tools. The paper industry is going forward in spite of adverse price conditions, the steel producers are working overtime and a great many smaller industries are prospering and expanding. These however are relatively unimportant as compared to the automobile industry. It is estimated that more than 90 per cent of all the orders for machinery in this area are traceable to the automobile and allied concerns.

If the optimistic predictions for fall business are accurate, the total sales of general machinery and machine tools for the year will probably be far ahead of any year in the history of the trade here.

NEW YORK

Conditions in New York may best be described as "spotty," with some dealers reporting increased business and some reporting a falling off. In one case, the month of July was the best month of the year in sales; several other dealers reported 10 to 20 per cent increases over June, and an equal number reported a falling off of a like percentage. August is uniformly expected to be considerably better, both from orders and from inquiries

which have been received up to the present.

Most orders were for small items, from a large variety of fields, the electrical, manufacturing, and copper industries, predominating. Used tools are in demand, but are seemingly hard to procure in many lines. General Electric maintained its usual volume of orders, and sent out inquiries for six 14-in., gear-in-head lathes. The Nichols-Crocker order has been placed, and the list is closed. There are also some indications of increased export business, one dealer reporting an export sale of 13 items. Prices are about the same, with the exception of the general planer increase of 5 per cent of several weeks ago, and an increase varying from 5 to 20 per cent on one line of heavy-duty axle and railroad lathes. Deliveries are getting no better, dealers reporting delivery dates from 6 weeks to 5 months in the future. There is a general belief that milling machine, lathe, and drill prices will be raised in the near future as a result of continued demand and poor delivery. Triplex Machine Tool Co. reports sales for the past two weeks as follows: 1 Swiss jig borer, 1 Swiss dividing machine, 2 Campbell nibblers, 3 Fosdick sensitive multiple drills, 1 Edlund drill press, 1 large power press.

* * *

Large Attendance Expected At Machine-Tool Show

Fifteen thousand executives and production specialists are expected to be in attendance at the National Machine Tool Show in Cleveland from Sept. 30 to Oct. 4. There will be on display, according to present indications, approximately 100 new machines, in addition to the improved standard machines on exhibit. New features of design, speed, power, and machines for the new cutting alloys will be shown.

The committee in direct charge of the 1929 Exposition is composed of: J. Wallace Carrel, Chairman; P. E. Bliss, Ralph E. Flanders, Robert M. Gaylord, James E. Gleason, and Henry Buker. The officers of the National Machine Tool Builders' Association, which is sponsoring the show, are: Henry Buker, president; H. E. D. Gray, first vice-president; C. C. Swift, second vice-president; August H. Tuechter, treasurer, and Ernest F. DuBrul, manager.

* * *

Bureau of Standards Offers Simplifications

Two additional requests for acceptance of simplified practice recommendations have been issued by the Division of Simplified Practice of the U. S. Bureau of Standards. They refer to hack-saw blades and forged tools. The recommendation for hack-saw blade size standardization specifies the lengths, widths, thicknesses, and number of teeth for both hand and power blades between the lengths of 8 and 24 in. Forged tools are specified as to weight, width of head, length of head, and similar dimensions for all common tools, including picks, mattocks, hoes, bars, wedges, anvil tools and tongs, track chisels, and various kinds of hammers. The requests for acceptance are obtainable at the headquarters of the Bureau in Washington, and have been issued to manufacturers, distributors, and users of these tools.

Twelve simplified practice recommendations have been developed by industry during the past fiscal year, three of them during the second quarter of 1929. A total of 98 recommendations have been developed since the Division began its work.

* * *

World Engineering Congress Delegates Chosen

Official delegates from the scientific and technical societies and educational institutions among the 250 Americans who will attend the World Engineering Congress in Tokio next fall were announced on August 10. Japanese authorities had requested that official delegates be limited to 60. President Hoover is honorary chairman and Dr. Elmer Sperry is chairman of the American committee of the Congress. The committee will sail with the other delegates from San Francisco in two specially chartered ships on Oct. 10. Among the organizations represented by the delegates are the American Institute of Mining and Metallurgical Engineers, the A.S.M.E., the A.I.E.E., and the A.S.C.E., known as the four "founder" societies. Also among the delegates will be men chosen by special organizations, so that their number will cover the whole range of engineering and technology in the United States, according to the announcement. Fred H. Colvin will represent the *American Machinist*, and will accompany the official party to Japan, where he will also visit Japanese manufacturing plants.

The following have been chosen as the official delegates to the congress:

Magnus W. Alexander	Charles T. Main
Dr. H. Foster Bain	R. R. Martel
Dr. George D. Barron	F. C. Martin
Edward Bartow	Charles D. Marx
F. W. Bradley	W. B. Mayo
Dr. George K. Burgess	C. W. Merrill
Howard E. Coffin	O. C. Merrill
W. H. Carrier	Ralh Modjeski
George S. Davison	L. A. Osborne
John V. N. Dorr	H. deB. Parsons
Byron E. Eldred	Asa E. Phillips
John R. Freeman	Donald B. Prentice
E. H. Fritch	Antonin Raymond
George W. Fuller	Henry G. Reist
Mrs. L. M. Gilbreth	Mark L. Requa
C. E. Grunsky	J. V. W. Reynders
Allen Hazen	Calvin W. Rice
H. D. Hibbard	Robert H. Richards
Maurice Holland	Joseph W. Roe
John C. Hoyt	David Rushmore
F. L. Hutchinson	Herman Schneider
James E. Ives	R. F. Schuchardt
D. C. Jackson	C. E. Skinner
F. B. Jewett	George Otis Smith
Lieut. Gen. Edgar Jadwin	Elmer A. Sperry
C. M. Keys	Francis Lee Stuart
C. W. Latimer	A. N. Talbot
C. K. Leith	Max Toltz
Wilfred Lewis	E. N. Trump
Paul M. Lincoln	Daniel L. Turner
Francis F. Lucas	H. Bruce Walker
	W. Y. Westervelt
	F. C. Hanker
	Charles W. Stone
	William Elmer

Business Items

The Dallas Brass & Copper Co., Chicago, has let contracts for the erection of three buildings at an approximate cost of $500,000. Substantial additions to the brass mill, the carpenters' shop, the engineering department, and the machine shop are included.

The Tool Engineering and Machine Co., Inc., Indianapolis, has filed articles of incorporation with the secretary of the State of Indiana. The corporation is formed "for the manufacture and sale of electrical and mechanical machinery of every kind." The incorporators are Edwin S. Pearce, Earl M. Costin, Burrell Wright and Otto N. Moore.

Smith Bros., Toronto, Canada, manufacturers of all types of motor bodies, are building a new plant in that city. The building is all on one floor and covers about 1½ acres, being 500 x 125 ft. Track facilities run the full length of the building, so that each department can be served from the car.

The Page Steel & Wire Co., Bridgeport, Conn., has moved its sales office to Pittsburgh. R. J. Teeple, S. B. Cairns, and J. J. Flaherty will be transferred there. The general sales office of the company will be located at 230 Park Ave., New York, in charge of W. T. Kyle.

The Sheet Steel Products Co., Michigan City, Ind., will reorganize under the name of the Michigan Products Corporation. The incorporators are D. A. Crawford, O. M. Carry, R. Jardine, H. G. Johnson and W. B. Sullivan.

Louis E. Emerman & Co., Chicago machinery jobber and retailer, has purchased the plant of the McCord Manufacturing Co. between 120th St. and 121st St., where it will concentrate its local activities.

Ottenheimer Bros., Hillen St. and Fallsway, Baltimore, Md., refrigerator manufacturers, plan the erection of a plant addition. Work on the building is expected to start this fall.

The Falk Mill Supply Co., Rochester, N. Y., has purchased the plant and equipment of the Climax Locomotive Works, Corry, Pa., and will begin rehabilitation of the plant in the near future.

The Aluminum Co. of America is erecting a 130x482 ft. machine shop at its New Kensington (Pa.) plant of brick and steel construction, two stories in height.

The Houdaille-Hershey Corporation has acquired the Skinner Company, Ltd., Canadian bumper manufacturer, through a stock transfer.

The Ohio Gear Co., Cleveland, Ohio, has appointed as its representatives, A. R. Young, Indianapolis, for the territory of Western Ohio and Indiana, The Specialty Sales & Engineering Co., Pittsburgh, Pa., for Pennsylvania, and the E. G. Long Co., New York, N. Y., for the New York territory.

The Hancock Manufacturing Co., New Cumberland, W. Va., is placing in operation a new steel stamping plant, which has just been completed.

The Rock Island Manufacturing Co., Rock Island, Ill., has added $125,000 in new equipment and will increase its

force 100, chiefly in the electrical appliance department. S. G. Longwell, superintendent, announced this week. The engineering department has been expanded and general expansion of the production schedules planned.

The Allen-Bradley Co., Milwaukee has appointed the Ward Engineering Co., Inc., Jacksonville, Fla., as representative for the Jacksonville territory.

The Wisconsin-Timken Axle Co., Oshkosh, Wis., is building two new plant additions.

Personals

E. D. SPICER, superintendent of the refrigeration department of the General Electric Co., has been made assistant manager of the Schenectady Works, effective August 1, according to an announcement made by C. C. Chesney, vice-president of manufacturing. Mr. Spicer has been employed by the General Electric Co. since 1924.

HAL R. KEELING, vice-president of an Indianapolis advertising company, has been elected a member of the board of directors of the Perfect Circle Co., Hagerstown, Ind. Mr. Keeling, who has been advertising and merchandising counsel for the company for the last eight years, fills the place left vacant by the resignation of E. J. Winters, Chicago.

R. B. MARSHALL, conveyor sales engineer, has become affiliated with the Chain Belt Co., Milwaukee, Wis., and will be located at 50 Church St., New York, N. Y. Mr. Marshall will also handle equipment manufactured by the Stearns Conveyor Co., Cleveland, a division of the Chain Belt Company.

W. T. WHALEN, formerly vice-president and general manager of the General Motors Export Co., has been elected vice-president and general manager of the Fokker Aircraft Corporation of America, Wheeling, W. Va. Mr. Whalen has been employed by General Motors since 1920.

CARL W. MESSINGER has been elected assistant treasurer of the Edward G. Budd Manufacturing Co., Philadelphia. Mr. Messinger has been purchasing agent for the company for the past three years.

P. F. BAILLET has been appointed manager of foreign sales for the Ampco Twist Drill Co., Jackson, Mich., and will have offices at 461 Eighth Ave., New York City.

CHARLES A. CRIQUI, president of the Sterling Engine Works, Buffalo, N. Y., was a passenger on the *Bremen* on its first eastbound voyage from New York.

DEAN DEXTER S. KIMBALL, McGraw-Hill director, and O. H. CALDWELL, editor of *Radio Retailing* and *Electrical Merchandising*, McGraw-Hill publications, have been appointed members of the new Committee on Communications of the American Engineering Council. Dean Kimball has also been appointed chairman of the committee on recent economic changes of the same organization.

HAROLD B. SMITH was elected vice-president of the Westinghouse Electric & Manufacturing Company at a meeting of the board held in New York on July 31. Mr. Smith was formerly general solicitor of the company. His office will be in the Westinghouse Building, 150 Broadway, New York, N. Y. Mr. Smith entered the legal department of West-

inghouse in 1919 and was appointed general solicitor in 1926. Prior to that time he was engaged in the practice of law in Chicago. He is a graduate of Northwestern University and Yale University and has also studied at the University of Chicago. He is a member of the bars of the states of New York and Illinois.

MAURICE B. GALLAGHER and F. DON WILLIAMS have been elected directors of the Dayton Airplane Engine Co. recently.

J. BLAIR SUTTON, president of the Sutton Engineering Company, Pittsburgh, has returned from a three months' business trip in Europe.

THOMAS BOWLER, North Vancouver, B. C., has invented a valve of entirely new design which will be manufactured by the Seattle Brass Company.

R. W. PROCTER has been appointed general sales manager of the Van Dorn Electric Tool Co., Cleveland.

Obituaries

JOSEPH E. HUBINGER, president of the Eastern Machine Screw Corporation and Yale Tire Co., New Haven, Conn., died at his home in that city on July 30. Mr. Hubinger was 72 years of age at the time of his death.

ALFRED EUGENE MATHEWSON, chairman and managing director of George Richards & Co., Ltd., machine-tool makers, Broadheath, near Manchester, and of Tilghmans's Patent Sand Blast Co., Ltd., also of Broadheath, died on July 16, aged 54. He was an authority on air compression and patented the Richards chain-driven side planer. He introduced also the system of specifying dimensional limits to which the machine tools manufactured by his firm could produce in operation. For his war work he was made an officer of the British Empire.

JOHN WILLIAM DARLING, chairman of the board of Darling & Sellers, Ltd., Keighley, died on July 20, aged 73. He was a member of the council of the British Machine Tool Trades Association.

CHARLES H. SCHRODER, 62, secretary of the Murray Iron Works, Burlington, Iowa, identified with the company for 48 years, died July 29 in a Burlington hospital. He was one of the veteran executives of the company.

LOUIS WEARDEN, who in 1907 founded the business now known as Wearden & Guylee, Ltd., chuck makers, Bradford, Yorkshire, died on July 23, aged 50.

Forthcoming Meetings

NATIONAL METAL CONGRESS. To be held in Cleveland September 9 to 13. Simultaneous meetings of the American Welding Society, the Institute of Metals Division, American Institute of Mining & Metallurgical Engineers, Iron & Steel Division, American Society of Mechanical Engineers, the Iron & Steel Division, A.I.M.E., and the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

NATIONAL METAL EXPOSITION. Eleventh annual, held under the auspices of the American Society for Steel Treating, Cleveland Public Auditorium, Cleveland, Sept. 9-14. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

AMERICAN RAILWAY TOOL FOREMEN. Annual convention at Hotel Sherman, Chicago, September 11 to 13. C. C. Ziegler, secretary-treasurer, 611 West Washington Blvd., Chicago.

MACHINE TOOL BUILDERS EXPOSITION. Under the auspices of the National Machine Tool Builders Association, Sept. 30 to Oct. 4, in the Public Auditorium, Cleveland, Ohio. Ernest F. DuBrul, general manager, 1415 Enquirer Bldg., 617 Vine St., Cincinnati.

SOCIETY OF INDUSTRIAL ENGINEERS. Sixteenth national convention at Hotel Statler, Cleveland, October 23 to 25. Requests for programs should be sent to S.I.E. national office, 205 West Wacker Drive, Chicago.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION. Semi-annual fall meeting at the Benjamin Franklin Hotel, Philadelphia, October 24 to 26. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

BLUE annealed and galvanized sheets at Pittsburgh dropped 10c., formerly a price to jobbers. Prices steady in Chicago, with plates, shapes and bars at $2.05. Mills in the Youngstown district continue at capacity, and prices are firmer, especially the scrap market. In the non-ferrous metal markets, demand is rather light for tin and zinc, strong for copper, with all prices same as a week ago.

(All Prices as of Aug. 9, 1929)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$18.44
Northern Basic	20.89
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	20.75
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.26@21.76
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.51
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	20.26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.30	3.90†
No. 12	2.15@2.25	3.45	3.35	3.95†
No. 14	2.25@2.35	3.55	3.45	4.00†
No. 16	2.40@2.45	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.45@2.55	3.85	3.70	3.80
No. 22	2.60@2.70	4.00	3.85	3.95
No. 24	2.65@2.75	4.05	3.90	4.00
No. 26	2.75@2.85	4.15	4.00	4.10
No. 28	2.90@3.00	4.75	4.15	4.25
Galvanized				
No. 10	2.70@2.80	4.20	4.05	4.05
Nos. 12 to 14	2.80@2.90	4.30	4.15	4.15
No. 16	2.90@3.00	4.40	4.25	4.25
No. 18	3.05@3.15	4.55	4.40	4.40
No. 20	3.20@3.30	4.70	4.60	4.55
No. 22	3.25@3.45	4.75	4.65	4.60
No. 24	3.50@3.60	4.90	4.75	4.75
No. 26	3.65@3.75	5.15	5.00	5.00
No. 28	3.90@4.00	5.40	5.25	5.25

*Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Glav.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

— Thickness — Decimal Fractions	B.w.g. and	Outside Diameter in Inches ⅛	¼	⅜	½	⅝	¾	1	1¼	1½
		Price per Foot								
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23		
.049"	18	.17	.18	.19	.20	.21	.23	.25		
.065"	16	.19	.20	.21	.22	.23	.25	.27		
.083"	14	.20	.22	.23	.24	.25	.27	.29		
.095"	13	.21	.23	.25	.26	.27	.29	.31		
.109"	12	.22	.24	.26	.27	.28	.30	.32		
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33		
.134"	10	.24	.26	.28	.29	.30	.32	.34		

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.60	3.65	3.60
Cold drawn, flat or square‡	4.10	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{4}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			49.50
Lead, pigs, E. St. Louis	6.60	New York	8.00
Zinc, slabs, E. St. Louis	6.80	New York	8.25

	New York	Cleveland	Chicago
Antimony, slabs	11.00	12.25	14.25
Copper sheets, base	27.75	27.75	27.75
Copper wire, mill, base	19.87½	19.87½	19.87½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	24.30	24.30
Zinc sheets (casks).....	10.50@11.00	11.70	10.11
Solder (½ and ½).....	33.75	32.75	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			65.00
Commercial genuine, intermediate grade.....			48.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt.....			12.00

*Delivered.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold rolled.....	53.00	40.00†
Tubing	75.00*	90.00
Angles, not rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Cold drawn.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity offered for sale:

	New York	Cleveland	Chicago
Crucible copper.....	15.25 @15.50	13.50	13.00 @14.00
Copper, heavy, and wire..	14.00 @15.25	13.00	12.00 @13.00
Copper, light, and bottoms	12.50 @13.25	12.50	11.00 @12.00
Heavy lead.....	5.12½@ 5.37½	6.25	4.75 @ 5.25
Tea lead.....	3.50 @ 4.00	4.25	3.75 @ 4.25
Brass, heavy, yellow.....	8.50 @ 9.00	8.00	8.00 @ 8.50
Brass, heavy, red.....	.....	12.50	11.75 @12.25
Brass, light.....	7.00 @ 7.50	7.50	7.00 @ 7.50
No. 1 yellow rod turnings.	9.50 @10.00	9.00	9.00 @ 9.50
Zinc.....	3.25 @ 3.75	3.25	3.00 @ 3.25

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†.....	.16	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.139	.11	.137
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.35
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt...	30– 5%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0325
Cold drawn shafting...	per lb..	.036	.035	.034
Brass rods.....	per lb..	.2125	.2125	.17
Solder (½ and ½).....	per lb..	.3375	.325	.315
Cotton waste, white...	per lb..	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	3.60	3.60	3.10
Lard cutting oil.....	per gal.	.75	.75	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	31½%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper.....	$4.86	$4.29	$4.29
Emery cloth.....	22.93	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper.....	2.08	2.04	2.04
Cloth.....	3.60	3.59	3.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,		2.75@2.85
Coke, prompt foundry, per net ton...	Connellsville,		3.75@4.85
White lead, dry or in oil...	100 lb. kegs....	New York,	13.75
Red lead, dry.....	100 lb. kegs....	New York,	13.75
Red lead, in oil.....	100 lb. kegs....	New York,	15.25

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, ⅞-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less..... ...	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

D. C., Washington—A. L. Flint, Genl. Purchasing Agent, Panama Canal—will receive bids until August 19, welding outfit, etc. Schedule 1980. Emery wheel and disc grinder, schedule 2494.

Mass., Boston—Gerard Electric Co., 92 Pearl St.—8 ft. engine lathe.

Mass., Boston—McLaughlin Co., 115 Federal St.—woodworking machinery of all kinds.

Mass., Brockton—Colonial Deco-Spray Co., 15 Elliot St.—combination band and circular saw, would consider separate machines.

Mich., Detroit—Central Machine Co., 6320 East Fort St.—machinery and equipment for proposed 2 story, 60 x 100 ft. machine shop. Estimated cost $55,000.

Mich., Detroit—Hotchkiss Tool & Engineering Co., 423 Mt. Elliott Ave.—machinery and equipment for proposed extension to machine shop.

Mich., Detroit—Manufacturers Machine Products Co., 1320 Mt. Elliott Ave.—shaper.

Mo., St. Louis—Service Welding Co., 2216 Morgan St.—electric welding machine.

O., Dayton—E. L. Hill, 320 Mercer Ave.—modern plate bending rolls, combination punch and shear, I-R air compressor, 400 to 600 ft., Ryerson friction saw.

O., Steubenville—Abrasive Mfg. Co., T. C. Clark, Jr., abrasive equipment; 1 lathe; 1 drill press; 1 air compressor and 1 automatic machine.

Vt., Rutland—P. R. Eaton, 117 West St.—veneer and plywood equipment, including 1 glue mixer, 1 heavy duty electric veneer press 42 x 96 in.; taping machine complete with electric motor; one 80 in. cutter and jointer; 1 hydraulic automatic veneer drier platens 42 x 96 in.; one 72 x 72 in. double ball bearing electric drive.

Opportunities for Future Business

Calif., Berkeley—Neilson Steel Aircraft Co., 2nd and Camelia Sts., plans the construction of 2 story, factory addition. Private plans.

Calif., Emeryville—**Merchant Calculating Machine Co.**, soon lets contract for the construction 2 story, factory and 1 story plant addition. Estimated cost $50,000.

Calif., Monrovia—Day and Night Water Heater Co., awarded contract for the construction of factory. Estimated cost $40,000.

Calif., Torrance—Columbia Steel Corp., purchased 85 acre site and plans the construction of plant.

Colo., Colorado Springs—Golden Cycle Mill Co., c/o A. E. Carlton, plans the construction of mill. Estimated cost $70,000.

Conn., East Hartford—A. Kahn, Archt., 1000 Marquette Bldg., Detroit, Mich., will receive bids about August 15, for the construction of 2 story, 400 x 985 ft., airplane factory, garage and office, for Pratt Whitney Aircraft Co. Estimated cost $1,000,000.

Conn., New Britain—New Britain Machine Co., 140 Chestnut St., awarded contract for the construction of 1 story, 25 x 260 ft., South St. Estimated cost $40,000.

Conn., Plainville—Trumbull Electric Mfg. Co., Woodford Ave. plans factory. Estimated cost $40,000. Engineer and architect not selected.

Fla., Miami—Resident Engineer, c/o Curtis Flying Service, Municipal Airport, will receive bids August 15, airport, incl. hangar, shops, etc. at Municipal Airport. Estimated cost $50,000. C. Russell, 29 West 57th St., archt.

Ill., Chicago—Edison Electric Appliance Co., South Menard Ave. and Taylor St., awarded contract for the construction factory.

Ill., Chicago—Western Electric Co., 504 South Clinton St., awarded contract for the construction factory for manufacture of telephone cable at Hawthorne Plant. Estimated cost $175,000.

Ill., Rockford—G. D. Roper Corp., Main St., awarded contract for the construction of factory and pattern shop for manufacture of gas ranges. Estimated cost $750,000.

Ind., Indianapolis—W. W. Hammond, 307 Odd Fellows Bldg., will build a garage at 30th and Pennsylvania Sts. Estimated cost $150,000. Doeppers & Lennox, 226 East Michigan Ave., Archts.

Ky., Louisville—U. S. Foil Co., 30th and Grand Sts., will build 2 story, 100 x 200 ft., tin, lead and aluminum foil factory, Hail Ave. Estimated cost $60,000. Work will be done by company forces.

Md., Towson—**Black & Decker Mfg. Co.**, awarded contract for the construction of 2 story, 140 x 200 ft. plant for manufacture of grinders, etc. Estimated cost $200,000.

Mass., Athol — Union Twist Drill Co., 70 Munroe St., awarded contract for the construction of 2 story, 60 x 105 ft. factory, addition. Estimated cost $60,000.

Mass., Boston—Owner, c/o E. B. Stratton, 25 Arch St., will soon award contract for two store and service garage buildings on Boylston St.

Mass., Needham—Buick Garage & Service Station, Chestnut St., is having plans prepared for a 1 story, 100 x 100 ft. repair and service garage. Private plans.

Mass., Wayland—Bd. of Selectmen, is having revised plans prepared for the construction of a 1 story repair and service garage on Main St. Estimated cost $40,000. J. R. Worcester & Co., 79 Milk St., Boston, Engrs. Former bids rejected. Noted July 4.

Mich., Berrien Springs—Clark Equipment Co. awarded contract for the construction of 1 story, 130 x 205 ft., transmission factory. Estimated cost $75,000.

Mich., Detroit—Public Lighting Comn., 174 East Atwater St., soon lets contract 1 story, warehouse and shop, Southfield Rd. Estimated cost $150,000. Smith, Hinchman & Grylls, 800 Marquette Bldg., archts.

Mich., St. Joseph—**Auto Specialties Mfg. Co.**, awarded contract for the construction of 1 story, 150 x 550 ft., foundry. Edgewater St. Estimated cost $750,000.

Mo., Hannibal—Chamber of Commerce, J. C. Raible, Jr., chn. Aviation Committee, and City plan airport, including hangars, shops, etc.

Mo., Sedalia—City and Chamber of Commerce, D. H. Powell chn. Airport Committee, plans airport, including hangars, shops, etc. Estimated cost $100,000.

N. H., Walpole—**American Mineral Products Co.**, 983 Main St., Hartford, Conn., plans the construction 1 story, 60 x 200 ft. factory. Estimated cost $150,000.

N. J., Belleville—Fletcher Thompson Co., Archt., 542 Fairfield Ave., Bridgeport, Conn., taking bids 2 story, 180 x 300 ft., factory, for Keller Mechanical Engineering Co., 70 Washington St., Brooklyn, N. Y. Estimated cost $150,000.

N. J., Jersey City—J. Goldenberg, 80 Woodland St., sketches 1 story, 110 x 220 ft. garage and showroom, Bergen and Virginia Aves. Estimated cost $150,000. C. Shilowitz, 26 Journal Sq., Archt.

N. J., Newark—Westinghouse Electric & Mfg. Co., 150 Bway., New York, plans manufacturing and distributing plant, here. Estimated cost $8,000,000.

N. Y., Brooklyn—M. Altman, 350 Stone Ave., plans the construction of an 86 x 402 ft. garage at Elton St. and New Lots Ave. Estimated $65,000. Kavy & Kavovitt, 350 Stone Ave., Archts.

N. Y., Brooklyn—Caverly Holding Corp., R. Rosenblatt, Pres., plans the construction of a garage, etc. at Fulton St. and Grand Ave. Estimated cost $40,000. W. T. McCarthy, Pierpoint St., Archt. Maturity after Nov. 1.

N. Y., Brooklyn—Eberhard Faber Co., Java and West St., plans the construction 5 story, 40 x 74 ft., pencil factory, Java and West Sts. Estimated cost $50,000. F. H. Klie, 250 Park Ave., New York, Archt.

N. Y., Brooklyn—United American Metal Corp., 59 Paige St., will build 2 story, 125 x 125 ft. shop. Work will be done by day labor and separate contracts. Estimated cost $40,000. C. Erda, 788 Manhattan Ave., archt.

N. Y., Brooklyn—J. S. Construction Co., 133 Floyd St., will build a 1 story, 100 x 200 ft. garage at East 98th and Union Sts. Estimated cost $40,000. H. M. Sushan, 367 Fulton St. Archt. Maturity November. Noted June 13.

N. Y., Jamestown—North American Lloyd Aircraft, 535 5th Ave., New York, will receive bids in September, airport, hangar, shops, Hunt Rd. and Baker St. Estimated cost $100,000. F. D. Amory, Jr., 551 5th Ave., New York, archt.

N. Y., Syracuse—Resident Engineer, c/o Curtis Flying Service, Inc., or C. Russell, 29 West 57th St., New York, are receiving bids for the construction of hangar, shops and airport buildings. Estimated cost $70,000. C. Russell, 29 West 57th St., New York, archt.

N. Y., Tarrytown—Chevrolet Motor Co., awarded contract for the construction of 1 and 2 story assembly plant. Estimated cost $1,500,000.

N. Y., Valley Stream—Curtis Airports, Inc., 29 West 57th St., awarded contract for the construction of hangars, shops, school, administration for airport. Estimated cost $3,000,000.

Minn., St. Paul—Minnesota Mining & Mfg. Co., Forest-Fauquier Sts., awarded contract for the construction of 2 story, factory addition, Forest and Fauquier Sts. Estimated cost $150,000.

Mo., Maplewood—Sunnen Products Co., 6417 Dale Ave., St. Louis, soon takes bids for the construction of 1 story, 120 x 168 ft. plant for manufacture of valve grinders and valve lifters, compressors, etc. Estimated cost $65,000. B. E. Elliott, Mexico, archt.

O., Canton—Canton Drop Forge & Mfg. Co., 300 Odd Row Pl., plans the construction factory, Willet Ave., East. Estimated cost $100,000.

O., Cincinnati—Quality Service Co., Reading Rd., awarded contract for the construction of 2 story, factory, Reading Rd. $40,000.

O., Cuyahoga Falls—Kent Machine Co., plans the construction of a 1 story, 70 x 100 ft., machine shop. Estimated cost $40,000.

Okla., Oklahoma City—Curtis Flying Service, 29 West 57th St., New York, plans the construction of airport, incl. hangar, shop and flying school. Estimated cost $75,000. C. Russell, 29 West 57th St., New York, archt.

Pa., Ambridge—H. H. Robertson Co., 14th St., awarded contract for the construction of plain extension. 14th St. Estimated cost $60,000.

Pa., Belle Vernon — Pittsburgh Steel Co., Union Trust Bldg., Pittsburgh, plans the construction of byproducts plant. Estimated cost $3,000,000. Private plans.

Pa., Easton—Ballinger Co., Archts., 12th and Chestnut St., Phila. soon lets contract for the construction of 3 story, 80 x 100 ft., manufacturing plant for Industrial Drinking Cup Co. Estimated cost $100,000.

Pa., Ellwood City—Aetna Standard Engineering Corp., Ellwood City, awarded contract for the construction of 1 story, 40 x 54 ft. and 45 x 120 ft. additions. Estimated cost $40,000.

Pa., Philadelphia—Atwater Kent Mfg. Co., Abbottsford Rd. and Wissahickon Ave. soon lets contract for the construction of radio manufacturing plant. Estimated cost $1,500,000. Ballinger & Co., 105 South 12th St., is architect.

Pa., Pittsburgh—Fero Electric Air Pump Co., B. M. Fero, in charge, 509 Penwood Ave., Wilkinsburg, plans the construction of 2 story, factory and garage, Pennsylvania Ave. Estimated cost $85,000. Engineer and architect not selected.

Wis., Milwaukee—National Parking Garages, Inc., c/o W. W. Ahlschlager, Eng., 65 East Huron St., Chicago, Ill., awarded contract for the construction of garage. Estimated cost $300,000.

Wis., Racine—Belle City Malleable Iron Co., awarded contract for the construction 2 story, 60 x 180 ft. steel foundry.

Ont., Chatham—Hayes Wheels & Forging Ltd., 240 Raleigh St., awarded contract for the consctruction 180 x 400 ft. auto wheel plant addition. Estimated cost $200,000. Noted July 11.

Ont., Preston—Canadian Office & School Furniture Co., Ltd., awarded contract for the construction of 4 story, 14 x 93 ft. factory addition, King St. Estimated cost $75,000.

Ont., Renfrew—Renfrew Industries Ltd., J. A Law, manager and director, plans the construction of addition plant for manufacture of refrigerators and kitchen cabinets. Estimated cost $50,000.

Ont., Windsor—Auto Specialties, Ltd., Tecumseh Rd., awarded contract for the construction of fuel house, Tecumseh Rd.

Que., Montreal—Henry Birks & Sons Ltd. 16 Phillips Sq., is having plans prepared for the construction of a garage on Drummond St. Estimated cost $250,000. Nobbs & Hyde, 14 Phillips Sq., Archts.

Que., Montreal—H. Murray, is having plans prepared for the construction of a 4 story, 128 x 163 ft. garage. Estimated cost $150,000. Barrett & Blackader, Canada Cement Bldg., Archts.

Jugo Slavia—Ford Motor Co., Highland Park, Detroit, Mich., plans the construction of automobile factory on Dalmation coast.